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MODERN Machine Shop

AUGUST, 1928

CINCINNATI, OHIO VOL. I, No. 3

Manufacturing Operations On Roots Blowers

By HOWARD CAMPBELL

ONE of the oldest firms in the Middle West is the P. H. & F. M. Roots Company, Connersville, Ind. Founded in 1859, this company developed the rotary principle of blowing air and has been manufacturing blowers practically ever since that time. Roots blowers are also used for pumping oil, water, and other liquids, and for pumping gas through the large station meters.

The original Roots plant was operated by power from a water wheel, and it was in the course of developing a more efficient water wheel that the impeller principle was discovered. The first Roots blower was installed to furnish the blast for a foundry cupola, and was the first of hundreds that are now in operation in foundries.

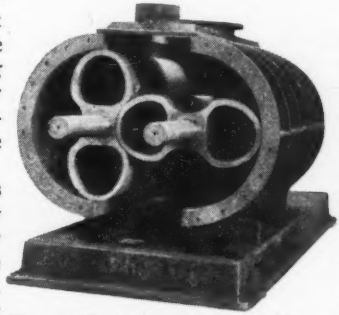


Fig. 1—End view of Roots blower, showing the impellers.

The blower consists principally of a case which serves as a housing for two impellers, the impellers being geared together so that their relative positions cannot vary. The impellers are finished all over and the shafts upon which they operate are mounted in babbitt bearings. The illustration Fig. 1 shows a Roots blower with the end plates removed so that the impellers can be seen.

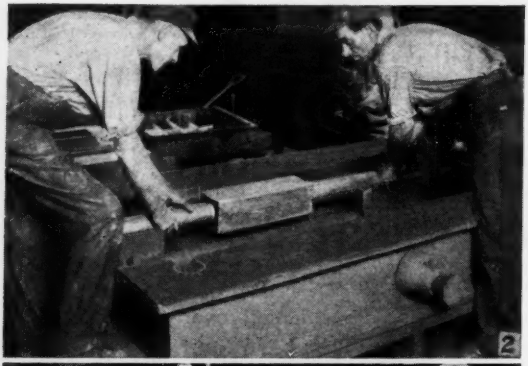
The impellers are of cast iron, and are made in the company's own foundry. The blowers are made in twenty-four different diametrical sizes, each size being made in ten different lengths. To simplify the molding operations, one pattern for each of the twenty-four sizes is provided and a cut-off core is used to determine the length of the casting. The molders shown in Fig. 2 are setting a core for the shaft hole.

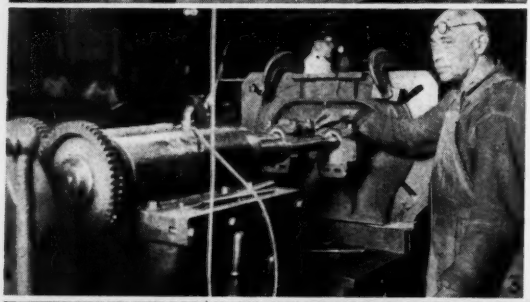
The impeller shaft journal bearings in the head plates are bored in horizontal boring mills of various sizes. All bearings are of babbitt, cast in the boxes, and are scraped-in after boring. The bearings in a headplate for a small size blower are shown in process of being bored in Fig. 3, the oper-

ation being performed in a Beaman & Smith 2-spindle boring machine. Both bearings are bored at the same time and are held to a limit of + or —.001 inch.

After the impeller has been bored and the shafts have been turned and pressed in, the journals are turned, for which the lathe shown in Fig. 4 is used. This operation consists of roughing only, .005 inch of stock being left for finishing after the planing operation is completed.

The impeller is finished to shape and size on a Niles planer, Fig. 5. The two cross-rail heads and a side head are used, operating simultaneously and following a cam as they feed across the piece, thus producing the desired shape on the casting. The cross-rail tool-slides have been released so that they slide up and down freely on the heads, and the back of each slide carries a cam roller which engages a cam on the under side of the rail. The slides are counterweighted so that the rollers are kept in contact with the cam.





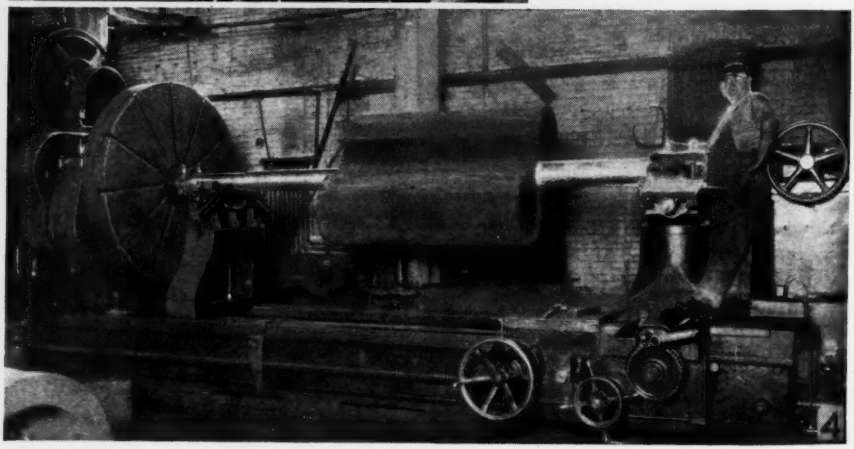
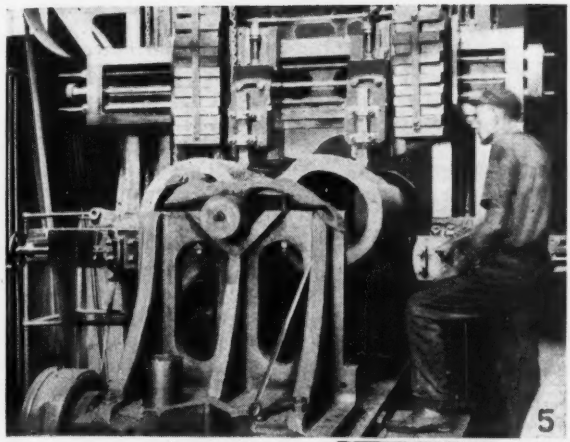


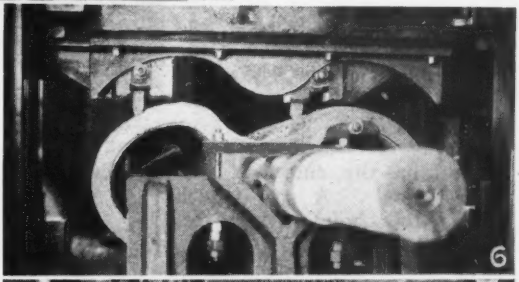
Fig. 2—Setting a core in a mold for an impeller casting. Fig. 3—Boring two bearings simultaneously in a blower headplate. Fig. 4—Turning impeller shaft journals after the shaft has been pressed into the casting.

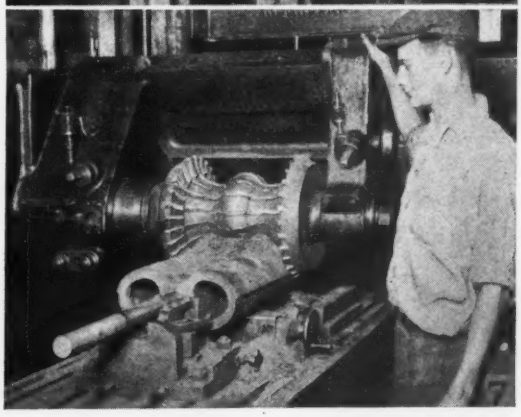


grinding wheel head being moved backward and forward, as the work passes the wheel, by the action of a roller against a cam. The roller is attached to the wheel head, and the cam is bolted to the machine-table. Weights,

Fig. 5—The impeller casting is finished on a planer. Three tools are in operation, being guided by cams. Fig. 6—Rear view of planer, showing the cams and rollers. Fig. 7—Small impellers are finished on the slab miller.

A rear view of the planer, showing the cam and tool-slides with the rollers in position, is shown in Fig. 6. The top and one side of the casting are finished simultaneously, then the casting is turned over and the operation is repeated, finishing the piece. A .040 inch feed is used and the broad-nosed tools produce a smooth finish.





Smaller impeller castings are machined on an Ingersoll milling machine, as shown in Fig. 7. Inserted-tooth milling cutters are used for this operation, each cutter being built up in sections which are locked together on the arbor. The casting is finished complete in two cuts.

The grinding of the inserted tooth cutters on the machine mentioned in the preceding paragraph is an interesting operation, involving the generation of a number of curved teeth to a definite form and size. The machine used is a specially-built grinder, Fig. 8. Here again the cam and roller mechanism is used, the attached to the wheel head, keep the roller in contact with the cam. Provision is made for adjusting the wheel both horizontally and vertically, so

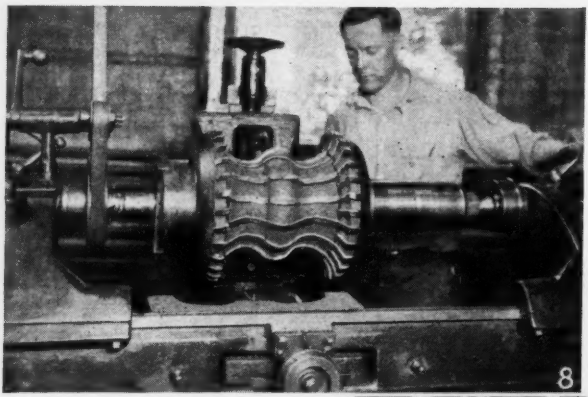
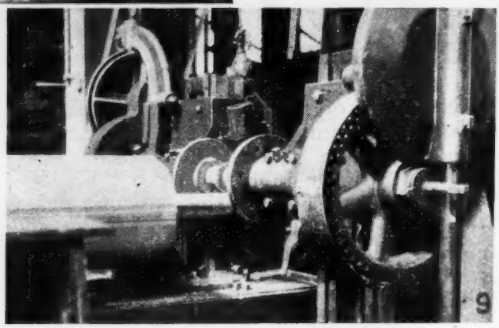


Fig. 8—Form-grinding an inserted tooth cutter. The form is produced by a cam which controls the movement of the wheel-head. Fig. 9—Milling keyways in impeller shafts. This 30-year-old machine does a first-class job.



that the clearance can be ground on the cutter at the correct angle. A soft wheel is used to rough the teeth to shape, the finish cut being taken with a hard wheel. The teeth are ground to a templet, and 002 inch is the maximum variation allowed.

Keyways in the impeller shafts are milled on the machine shown in Fig. 9. Here is a case of an old machine which, instead of being scrapped or sold at a low figure, is kept set up for one operation alone. The machine is thirty years old, but it mills keyways with the speed and accuracy of a modern machine.

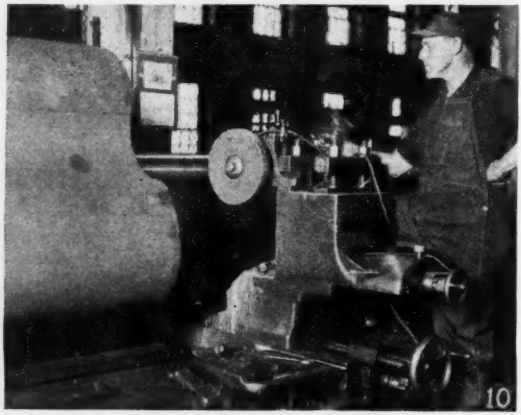
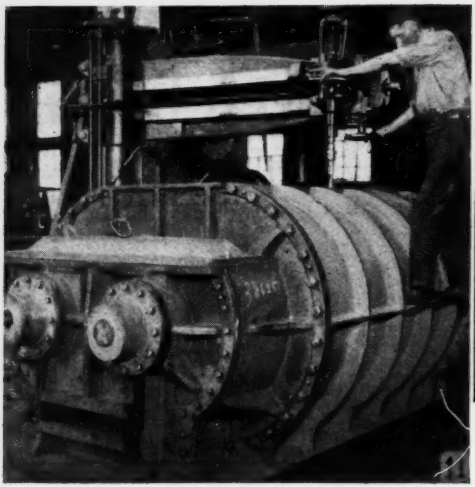


Fig. 10—The shafts are ground and polished with the aid of a U. S. Electrical Tool Co. angle plate grinder, attached to a lathe tool-post.

When all the other operations have been finished, the impeller shaft is ground and then polished with a buffing wheel. Approximately .004 inch is removed in the grinding operation, for which a U. S. Electrical Tool Co. angle plate grinder, attached to the tool post of a lathe, is used. After the grinding has been completed, .001 inch is polished off with a buffing wheel, which gives the shaft a fine finish. The grinding attachment, with a buffing wheel in use, is shown in Fig. 10. The use of such an attachment makes it possible to give the impeller shafts a finish that could otherwise be equalled only by the use of a large, expensive grinding machine.



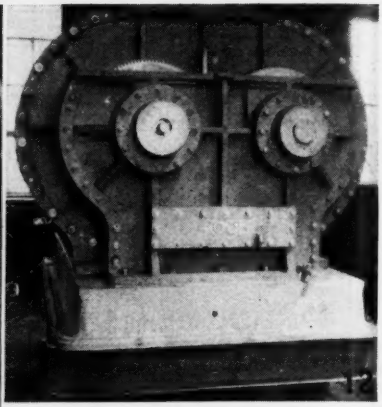


Fig. 11—Tapping cover-plate holes in a station meter case. Fig. 12—Giving the meter the final test before shipping.

The large blower and meter cases are drilled and tapped on the radial drill press shown in Fig. 11, where a mechanic can be seen in process of tapping a number of 1-inch holes for the cover-plate. The illustration Fig. 12 shows a station meter of the larger type set up for testing. Gas meters of the impeller type are coming into general use for measuring the output of gas plants, and have been proved more accurate than the old methods of measuring. The meter shown passes 100 cu. ft. of gas per revolution through the case, and the impellers turn at a speed of 125 r. p. m.

An outstanding feature of the Roots organization is the length of time the employees remain with the company. Good workmanship can usually be found where harmony prevails between the management and the workmen, and harmony is usually found where the men continue at their jobs year after year. The Roots Company has one employee who has been with the company sixty years, six men who have worked continuously in this plant for more than 40 years, six men who have served more than thirty years, 17 men who have served over twenty-five years, sixteen men who have worked fifteen years, and thirty-seven men who have served over ten years. The superintendent, Mr. Chas. T. Gordon, has been in the employ of the company thirty-two years, having started as an apprentice. Such a record could well be pondered by manufacturers whose labor turnover runs from 50 per cent to several hundred per cent per year.

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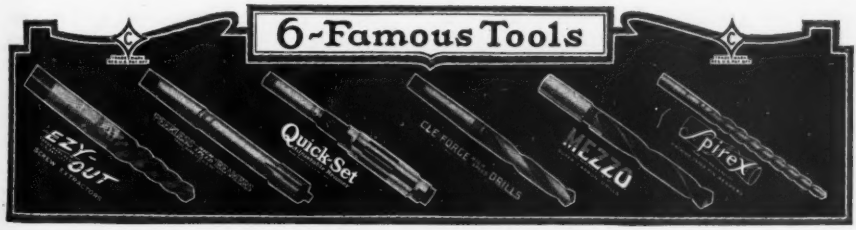


Conveyors Set Pace in assembling Auburn Cars

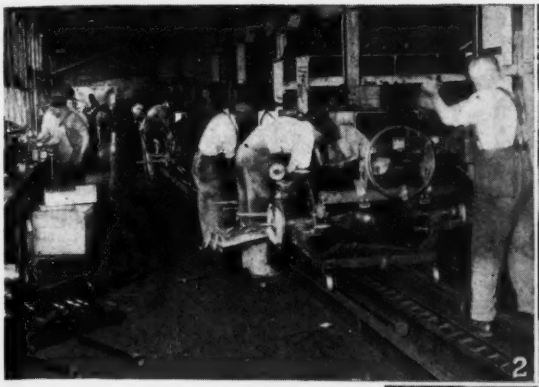
1

By A. R. KRUEGER

PRODUCTION in the Auburn Automobile Company's plant is controlled by the assembly line conveyors, of which there are two, each 516 feet long. The conveyor lines are parallel, starting at the end of the shop where the frames are riveted together, and finishing at the loading dock. The various parts are assembled to the chassis in their proper sequence as it moves slowly along, the stocks of parts being either piled at the points where they are to be used, conveyed across the shop from stock rooms at the side, or produced at the proper moment from openings in the floor or ceiling. The conveyor lines are automatically operated and are never stopped during working hours except in case of emergency, consequently parts and materials must always be on hand and ready for use.

The conveyor consists of a large sprocket chain which moves in a trough that is located centrally between two rails. The chassis rests on two three-cornered, three-wheeled trucks, one under each end, the front wheel of each truck resting in one of the openings in the chain while the other two wheels ride on the rails. As the chain moves along, the trucks and chassis are pulled with it.

The first operation in the assembling of the chassis, after the hangers and irons have been assembled to the frame, is to put the springs and axles on. Then it is dropped onto a pair of trucks on the conveyor and started on its way. A few feet farther on the motor is dropped into the chassis from an overhead monorail system, as shown in Fig. 1. The motors are stored in a separate building at the side of the main assembly plant, where they are safe from injury and out of the way. As soon as a motor has been dropped into a chassis, however, another is brought in and left suspended from the monorail in



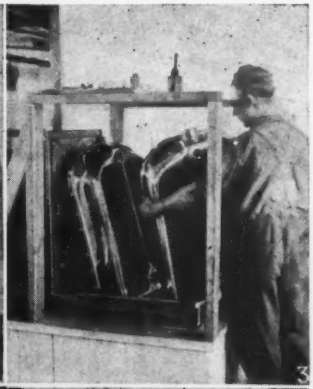


Fig. 2—View of the main assembly line. Parts are added while the chassis is moving. Fig. 3—Radiators are brought from the storeroom in the basement to the conveyor line by this elevator. Fig. 4—An overhead conveyor brings fenders from the enameling room.

readiness for the next chassis.

The transmission is now added, along with the steering gear, muffler and other parts. The illustration of the rear end of a chassis, Fig. 2, gives a clear view of one of the trucks and the rails and conveyor chain. At the opposite end of the room is the opening through which the conveyor passes into a spray booth where the chassis is given a coat of black paint. The spraying is done in an enclosed booth on account of the fact that the finish used is highly inflammable and also that the spray will be confined as much as possible.

As the chassis leaves the paint-spraying booth, it passes into another assembly room, where the radiator, fenders, and body are added. The radiators are stored in the basement, which is connected with the main assembly floor by an elevator, shown in Fig. 3. Two radiators are sent up at a time and are removed from the elevator by the mechanic who assembles them to the cars. A small store of fenders is maintained between the assembly lines, convenient to the points where they are put on, the fenders being brought from the enameling room by the overhead conveyor shown in Fig. 4. This conveyor also consists of a sprocket chain which is held up by small trucks, attached to the chain and riding on the flanges on either side of the monorail, as shown. The chain is driven by the sprocket shown, to which power is applied by a small motor. One man is detailed at this point to remove the fenders from the conveyor as they come in and to keep a supply at hand in readiness for the assemblers.

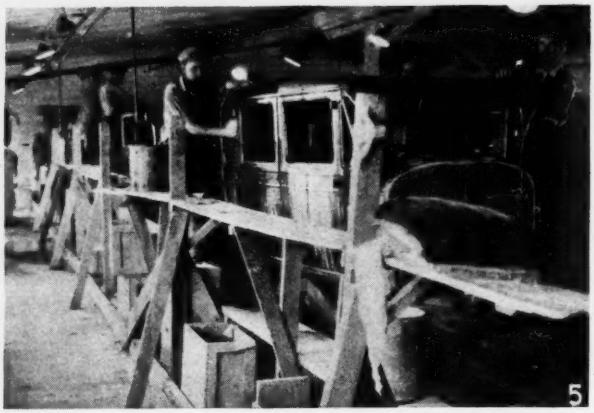
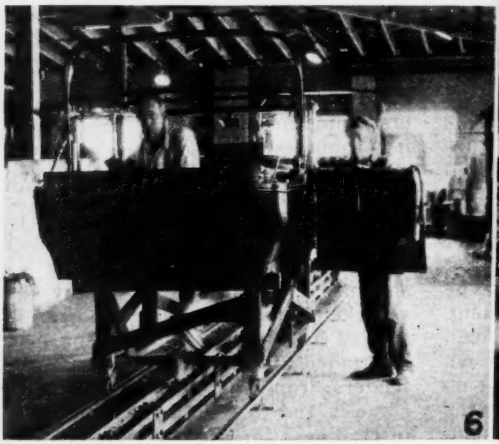


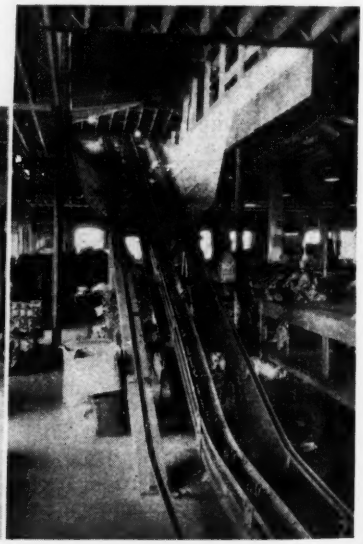
Fig. 5—Rubbing and sanding bodies while en route.

where about the floor or placed in the conveyor line equally well. When in the line, however, the wheels ride in steel channels that keep them in line while a moving chain, midway between the channels, provides motive power. The bottom rear cross-member of each truck is provided with a steel pin that is engaged by one of the dogs that are attached to the chain at intervals of 30 inches, and the truck is thus carried along. The priming coats and glazing coats are applied as the body moves along, then it is water-rubbed by the mechanics shown in Fig. 5. When the body is completely finished, it is passed into the trim-shop where the tops and cushions are put on, all operations being performed while it is

While the chassis are in process in the final assembly, the bodies are going through the various operations in the process of painting and trimming, on the second and third floors. As the bodies are brought into the paint shop, each is set on a four-wheel truck that can be moved any-

Fig. 6—A conveyor line in the trim shop keeps the bodies moving. Fig. 7—This incline brings the bodies down one floor to the top shop.





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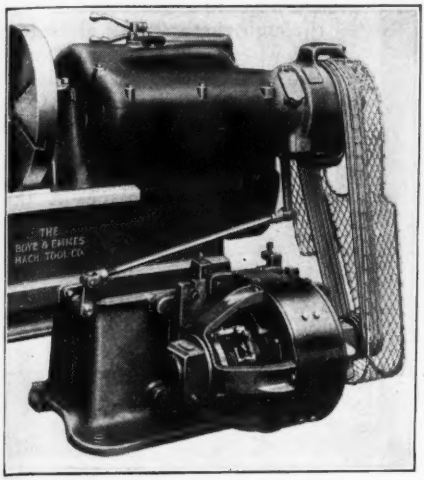

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progressing through the department. The construction of the conveyor is clearly shown in Fig. 6, where one mechanic can be seen putting a rear cushion in while another is trimming a door. By the time the body makes the turn at the end of the room, the cushions will have been completed and the body will be ready for the top.

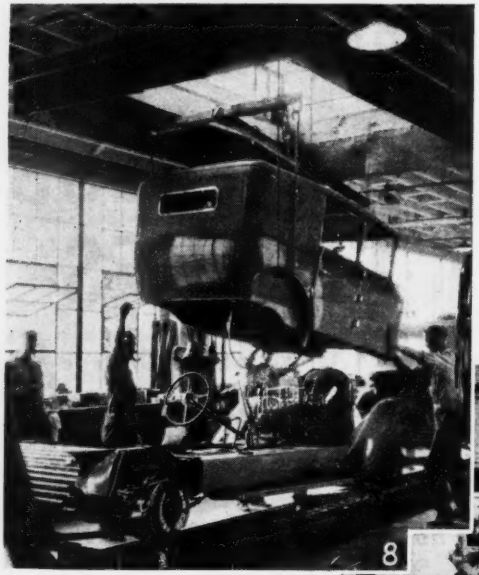


Fig. 8—Here the finished body is lowered onto the chassis through an opening in the top shop floor.

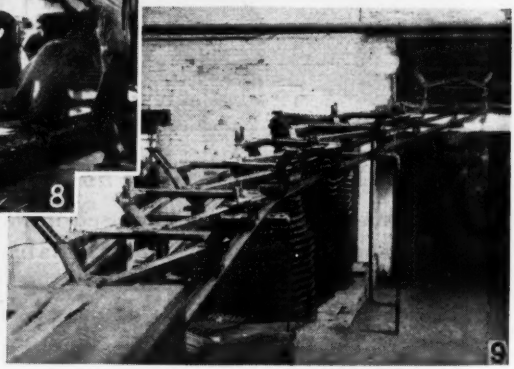
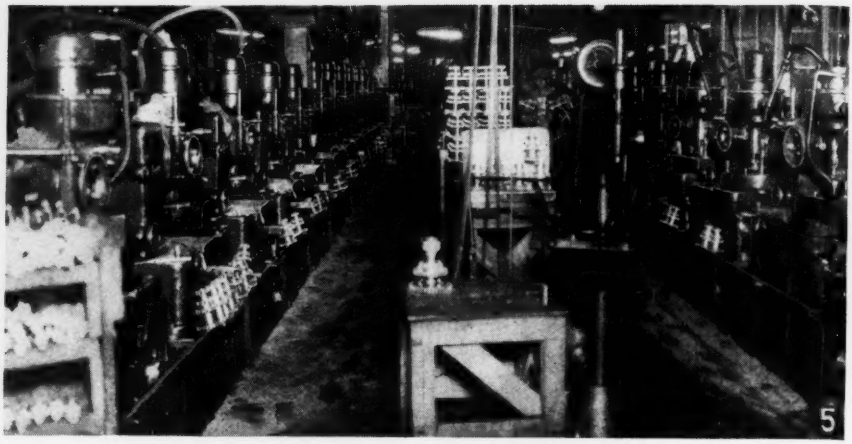


Fig. 9—Empty trucks returning to the start of the assembly line.

At this point the conveyor passes down through an opening in the floor, Fig. 7, to the top department on the second floor. The dogs on the conveyor chains are so designed that they keep the truck from moving either forward or backward, thus preventing the truck from sliding ahead when coming down the incline. Here the final trimming operations are completed and the body is ready for the chassis.

As the last touch is given to the body, it stops near a large, square opening in the floor, located just over the spot in the final assembly where the bodies are to be assembled to the chassis. Here the body is picked up with a hoist and lowered through the opening shown in Fig. 8, where it is taken in charge by the men below. The hoist is arranged so that it can be operated from either the second or first floor, thus making it possible for the final assemblers to drop the body in place at the right moment.

In the next operation the wheels are put on, then the conveyor dips under a platform so the car can be run off the line. A little farther on the conveyor chain reappears, this time traveling up an incline to a point where the trucks can start traveling, by gravity, to another conveyor chain that returns them to the starting point again. This chain is located near the ceiling, up out of the way, and carries the trucks to a point where they can slide down an incline to the assembly conveyor again. Several of the trucks are shown on the incline in Fig. 9.



Making 14,000 Gears Per Day

By AVERY E. GRANVILLE

FOURTEEN thousand gears is a lot of gears, but that is approximately the number turned out every twenty-four hours at the plant of the Warner Gear Company, Muncie, Ind. Here is a big, modern production plant that had its beginning in an idea —the idea that gears for automobiles could be produced better and cheaper by an organization of specialists than by the automobile manufacturers themselves. And better is cheaper, because transmission gears not only have to stand more shocks and wear and tear than any other part of the car, but they are expected to carry on indefinitely and without audible sign of existence. The extent to which this idea is being recognized is evidenced by the fact that a production of some 2,400 gears four years ago has multiplied to 14 000 today, and new equipment is constantly being added in preparation for increased orders.

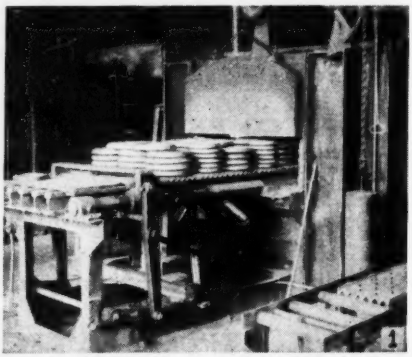
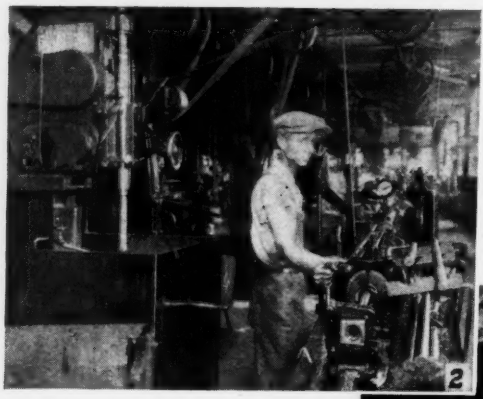


Fig. 1—The gear-blanks are normalized and annealed in this double furnace.

All gears are made to the customers' specifications, but every effort possible is made to exceed the customer's expectations insofar as quality is concerned. The quality of the product is controlled from the laboratory and each lot of material in production is under close supervision from the time the raw stock

enters the receiving room until the finished gears have passed the final inspection. The inspection department maintains a constant check on the accuracy of the dimensions by the use of highly-sensitive machines, and the production equipment is of the latest type. The plant is of one-story, saw-tooth roof construction, affording a maximum of light which is augmented by mercury lamps.

All gear-blanks are sent from the rough inspection to the heat-treat department, where they are put through a normalizing and annealing treatment before being machined. One of the furnaces used for this operation is shown in Fig. 1, with one loading of bevel gear blanks in position to be moved into the furnace. In this furnace the gears are given a "normalizing" treatment, which eliminates forging strains and makes the grain of the steel uniform in size. As the blanks leave the furnace at the opposite end, they are cooled by air and then pass on into a second furnace where they are annealed. This treatment leaves them in condition for machining.



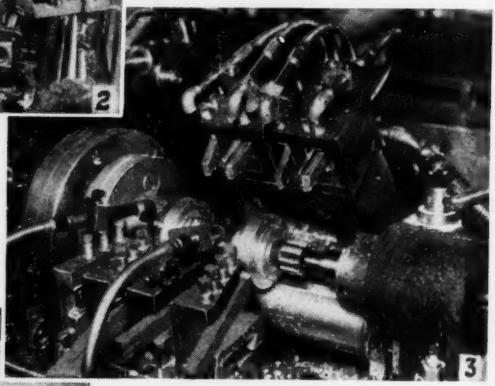
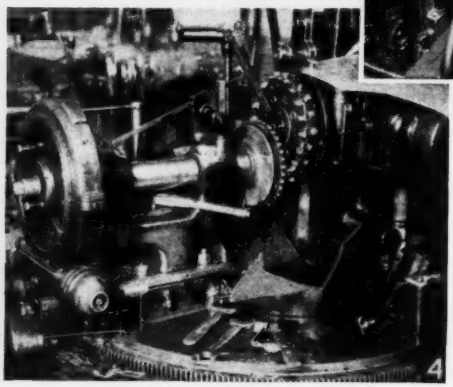


Fig. 2—Rough drilling and broaching the gear blanks. Fig. 3—Turning gear blanks in the automatic lathe. The two blanks are turned, faced and necked in one operation. Fig. 4—Cutting the teeth in a spiral bevel gear.



The first machining operation consists of finishing the hole through the center so that the gear can be located properly for subsequent operations. In this operation, shown in Fig. 2, the hole is rough drilled on a heavy duty vertical drill press and then broached. The mechanic, who operates both drill and broaching machine, is broaching the splines in a sliding gear, using a hydraulic broaching machine for the operation. This is only one of a large battery of first-operation machines, however, some of the

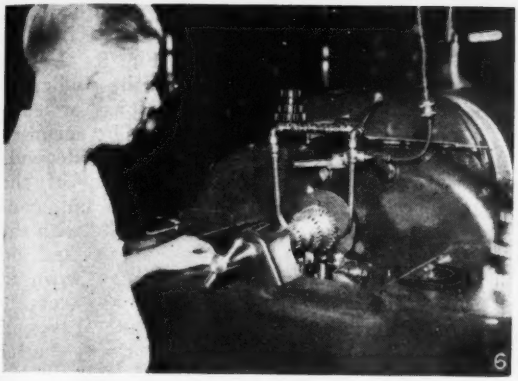


Fig. 6—Spur gears are finished to size and shape in this gear-shaving machine. The cutters operate back and forth, removing fine chips while the gear is slowly revolved.

broaches being of the vertical type.

The operation of turning gear blanks on an automatic lathe is shown in Fig. 3. The blanks and the shafts upon which they are to remain permanently are brought together at this point, the operator pressing the gears onto the shaft while the machine is operating on the previous set. Two diameters are turned on each gear by the tools located in the front toolholder, while the tools at the rear perform the facing and necking operations. All tools work at the same time and the entire operation is automatic.

The illustration, Fig. 4, shows how the teeth are cut on a spiral bevel gear. The machine is a bevel gear generator, using an inserted tooth cutter. Cluster gears are roughed out on the gear shapers shown in Fig. 5, at the head of this article, and are then finished on the gear shaving machine shown in Fig. 6. In this machine the gear revolves slowly while two cutters of the same contour as a gear tooth, slide back and forth horizontally and finish each tooth in turn, to the correct size and shape. Approximately .008 inch of stock is removed in the finish operation. A shaded light is provided just above the work, and oil-pipes on either side provide for the necessary coolant.

The gear-teeth are

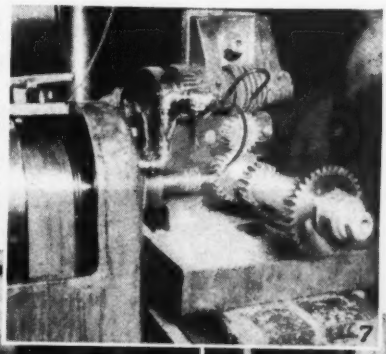
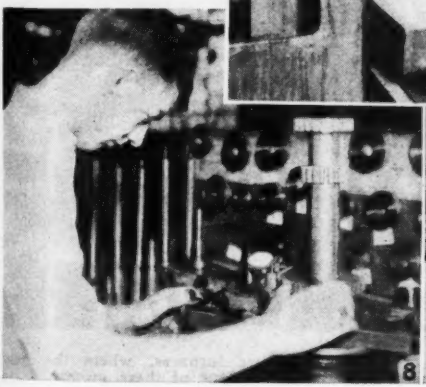
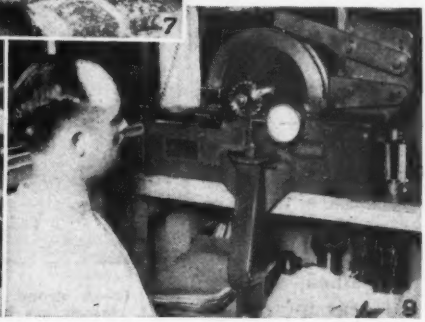


Fig. 7 — Chamfering a gear on a gear-chamfering machine. Fig 8—The product of each tooth-cutting machine is tested at frequent intervals to make sure that the required standard of accuracy is being maintained. Fig. 9—Each cutter used must pass inspection on a gear cutter tester.





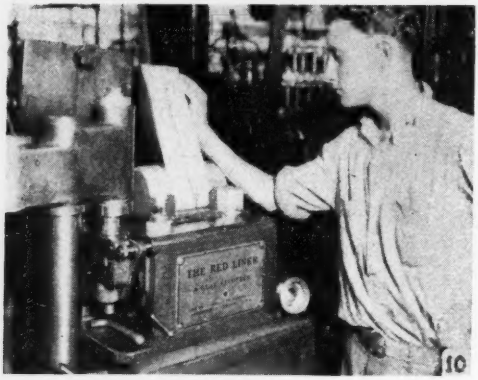
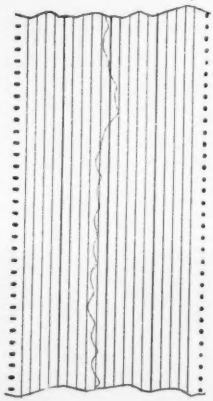


Fig. 10—Internal gears are inspected by the use of the "Red Liner" gear recorder, in which the variations of the pitch line are recorded on paper with red ink. Fig. 11—Section of a record from the "Red Liner" gear recorder. The pitch-line of this gear is within .001 of normal.



chamfered on the machine shown in operation in Fig. 7. As the tool revolves, it moves around the end of the tooth, this action being controlled by mechanism which co-ordinates the movement of the tool with the revolving action of the gear. All the teeth on the gear shown are chamfered in one minute, including loading time. These machines are operated in gangs of two, with one operator to two machines.

The product of each gear-cutting machine is tested at frequent intervals to make sure that the required standard of accuracy is being maintained, a special gear tooth testing machine being used for this purpose. An operator is shown testing a gear in Fig. 8. As the gear is revolved, the indicator shows the dimensions of each part of each tooth. The accuracy of a gear, however, depends largely on the accuracy of the cutter with which it is cut, consequently the tests begin with the cutters. Cutters are tested on the gear cutter tester shown in Fig. 9, which gives an accurate reading of the involute curves of the cutter teeth. Every cutter used must pass this test within the required limits for accuracy.

Internal gears present a more difficult problem to the inspection department, and until the "Red Liner" gear recorder was developed, accurate inspection of an internal gear was an intricate and usually unsatisfactory process. The "Red Liner," however, shown in Fig. 10, not only mechanically inspects the accuracy of the gear teeth, but records the actual variations in the pitch line by means

(*Continued on page 59*)

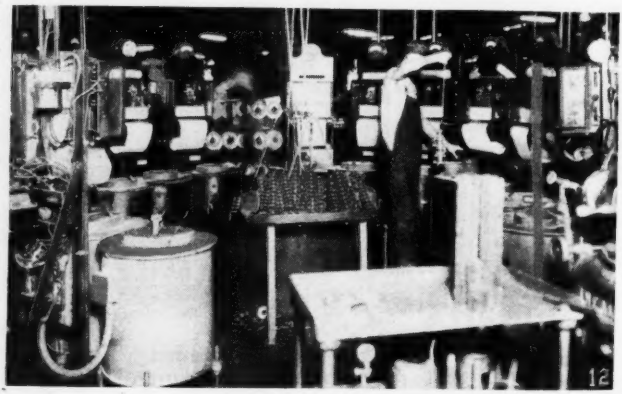


Fig. 12—A group of "Hump" electric furnaces, where the gear clusters are hardened. There are four of these groups.

Training "Armco" Foremen

By PHILIP WINTER

SOME fifteen years ago Mr. George M. Verity, president of the American Rolling Mills Company, said that one of the policies of this company should be to "build and maintain a high-grade, efficient, loyal, ambitious, aggressive, and successful working organization to whom work is a pleasure and extraordinary accomplishment an all-consuming ambition." The success of this policy is a matter of history in the industrial field. One of the important factors in the building of such an organization has been the group meetings of the plant foremen, which are held once a week under the direction of a member of the Training Department. The hit-or-miss method of selecting subjects for discussion which characterizes so many foremen's meetings has been long since discarded for a definite plan or method of procedure, and every one of the foremen comes to the conference armed with a knowledge of the topic and prepared to take an active part in the discussion.

The meetings are held, usually, on a Tuesday or Wednesday evening, but the subject for discussion is selected the previous Friday afternoon. The subject is selected by a "cabinet" which is composed of the Director of Training, four department foremen, five conference leaders who are also foremen, two superintendents, and a member of the training department, making a total of twelve members. Each one submits a topic and one is selected, after which a number of the major points that should be discussed are also listed. The subject and subtopics are then listed and copies are sent to the formen immediately so that each will have an opportunity to develop points for discussion before the meeting.

The members of the cabinet are selected by the Director of Training, and are changed at frequent intervals so as to give every one of the department heads a voice in the selection of the subject. This plan places a certain amount of responsibility for the success of the conference on each one, at one time or another, and stimulates interest. Being in close touch with problems of management and production, as they are, and acting both as the company's representative to the men and as a representative of the men to the company, they are usually able to contribute ideas which make for a better understanding and a more harmonious relationship between the company, its executives, and the workmen.

The plan of having group meetings of the foremen has been in operation about seven years, but the conference method, as outlined, has been in operation about two years. This method of procedure is considered the most satisfactory and productive. In order to keep the course more practical than theoretical, the cabinet is supplemented by an advisory committee of plant superintendents. These men may be considered as past masters in the problems with which the foremen are confronted in their daily work. Consequently they are always able to point out any fallacies in the conclusions arrived at and can usually contribute criticism of a constructive nature.

The meetings and the discussions that take place are considered as les-

sons. A fair idea of the topics and the points that were brought out in the discussion of these topics is indicated by the following outlines of subjects that have been developed in discussion:

Carelessness

A definition has been given as—Unintentional Failure to Live Up to Job Requirements.

a. Why are men careless?

1. Mentally weak.
2. Inexperienced and lack of skill.
3. Poor instructions.
4. Poor equipment.
5. Poor material.
6. Hasn't sense of accuracy.
7. Uninformed or vague instructions.
8. Failure to receive clear instructions.
9. Lack of a job analysis.
10. Indifference.
11. Absent-minded.
12. Too much familiarity.
13. Poor judgment.
14. Conceit.
15. Poor health.
16. Loss of rest and sleep.
17. Home troubles and financial difficulties.
18. Poor working conditions.
19. Jealousy.
20. Working too fast or anxious to please.
21. Lack of a square deal.
22. Independence.
23. Overconfident.
24. Taking a chance.
25. Lack of concentration caused by anything.

b. What are the results of carelessness?

1. Personal injury.
2. Destruction of new material.
3. Rapid depreciation of machinery, tools, and equipment.
4. Increased cost of production.
5. Increased labor turn-over.
6. Lower wages.
7. Slack work, especially in times of depression.
8. Unpopularity for both employes and company.
9. Poor quality.
10. Decreased production.
11. An inefficient organization.
12. Changes in personnel.
13. The making of an assignment.

Prosperity

Definition: A person is prosperous in proportion to the degree to which his wants are satisfied.

a. Explanation of national progress.

From 1922 to 1926, increased production per man hour

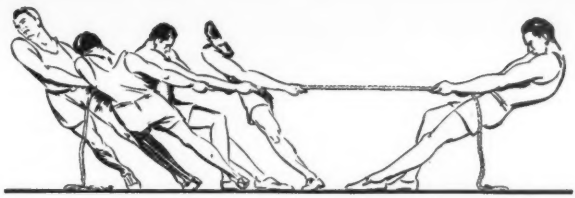
In shoe business	116 per cent
Cement	159 per cent
Steel	149 per cent
Auto	310 per cent

1. Increase production with minimum amount of human effort.
2. Natural resources.
3. Ambitions.
4. Credit structure.
5. Free spending of rapid turnover.
6. Large capital.
7. Efficient management.
8. Co-operation.
9. Education.
10. Research.
11. Organization.
12. High real wage.
13. Competition.

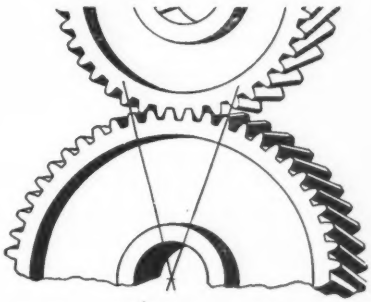
b. How to stabilize our prosperity.

Present waste in industry..... 49 per cent
Management and foremen responsible for ..... 25 per cent

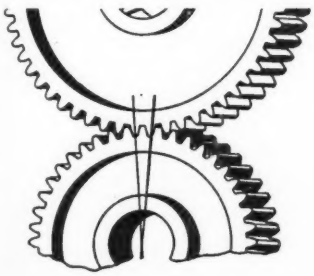
1. Elimination of waste.
   a. Conservation of natural resources.
   b. Better supervision.
   c. By-products (utilization).
   d. Quality and production bonus.
   e. Salvaging and reclaiming.
2. Federal Reserve system.
3. Mutual understanding between men and management.
4. Employes becoming stock holders of their company.
5. Development and research.
6. Simplification and standardization.



3½ to 1 in Favor of Helical Gears



MONARCH Lathes are smoother, quieter, more powerful because of the use of helical gears in the headstock. The drawings at right and left tell you WHY. In helical gearing, 3½ teeth are always in mesh, resulting in smooth, quiet, continuous transmission of power without jar or shock. With spur gearing, but one tooth is driving at a time; the load is suddenly transferred to the ends of the teeth and along their entire length, causing shock and jar which result in tooth marks showing on the work. Helical gears wear evenly and retain perfect alignment—work smoothly throughout the life of the machine. Spur gears soon wear out of shape, causing greater noise, vibration and back-lash—and shortening the life of the lathe.



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Monarch Lathes

Helical Gears - Timken Bearings

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Duties of Foreman to Management

a. Things he should do.

1. Should be, if possible, the strongest link in the chain of the organization.
2. Should be the connecting link between the men and the management.
3. Should keep management informed of the condition of machinery and equipment.
4. Should keep the management informed regarding the attitude of the men on certain company policies and principles.
5. Should inform management of unrest due to any influences either outside or inside the plant.
6. Should keep management informed of men who possess exceptional abilities.

b. Things the foreman should not do.

1. Should not make unfavorable comments about management.
2. Should not pass the buck.
3. Should admit fault and accept blame for things.
4. Should not assume an attitude that an injustice is being done.
5. Should not make unnecessary comments about anything.
6. Should not report to work late.
7. Should not clean up before quitting time.
8. Should not spend too much time away from his department.
9. Should not eat lunches during working hours.
10. Should not leave his department unnecessarily.
11. Should not question a company policy or an order from the management in the presence of the men.
12. Should not talk one way to men about some point at issue and another way to the management.

How Can the Foreman Build His Prestige and Dignity?

1. Knowledge.
2. Proper methods.
3. Personality.
4. Commendable character.
5. Self-control.
6. Good judgment.
7. Sense of leadership.
8. Sense of fairness.
9. Loyalty.
10. Knowledge of human nature.
11. Mutual confidence.
12. Open mindedness.
13. Good personal appearance.

A foreman has prestige and dignity if he—

1. Practices company policies.
2. Makes few promises and fulfills those promptly.
3. Is an old employe.
4. Practices safety.
5. Knows his men.
6. Takes an interest in his men.
7. Is prompt.

Now the foreman has prestige and dignity, how may he ruin it?

1. By being too familiar with his men.
2. By being immoral.
3. By using poor judgment.
4. By lack of interest.
5. By lack of self-control.
6. By lack of tact.
7. By being too easy.
8. By excessive harshness.
9. By breaking promises.
10. By showing superiority complex.
11. By poor personal appearance.
12. By being unfair in decisions.
13. By being untruthful.
14. By procrastination.
15. By tardiness.
16. By being lazy.
17. By failing to carry out safety suggestions.
18. By not having confidence.

An interesting feature of the foremen's training program is the weekly bulletin which is sent to every foreman in the plant. The bulletin gives an outline of the subject as developed, together with the most interesting points that were brought out in discussion. The bulletin also announces the subject for the next conference and serves as an invitation to be present. The bulletins have proved very valuable in stimulating interest in the meetings and the foremen look forward with enthusiasm to receiving them. This interest is increased by

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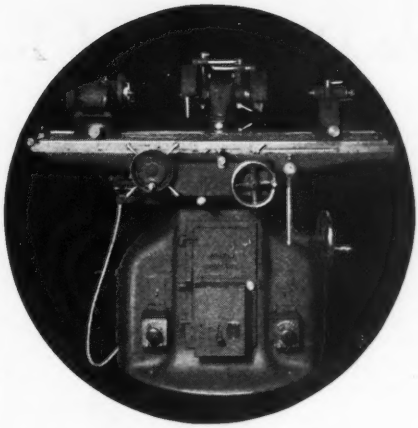

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Multiple Drilling and Tapping

By DONALD A. CLARK

UNDOUBTEDLY the first step forward in quantity production was taken when the English textile manufacturers installed machinery to perform labor that had formerly been done by hand. The increased production and lower manufacturing costs very soon forced prices down to a point where everyone could afford to purchase textiles in quantities, and the mills were busier than ever before.

This phase of history is being repeated today in nearly every branch of industry, and is particularly true of the automobile industry. High production machines have reduced costs on automobiles to such a point that practically every individual can afford a car. In the face of steady increases in the costs of other commodities—costs which in many cases were doubled or tripled—the manufacturing costs and selling prices of automobiles have been reduced in direct ratio to the development of more productive machinery. And of such machinery, the multiple drilling machine is an excellent example.

The first multiple drill undoubtedly consisted of two single spindle machines placed together so that one man could operate both machines. It was but a short step to putting two spindles on a single column, and then to a sliding head carrying a number of spindles. The final stage of development was reached with the production of machines carrying several heads, an example of which is shown in Fig. 1.

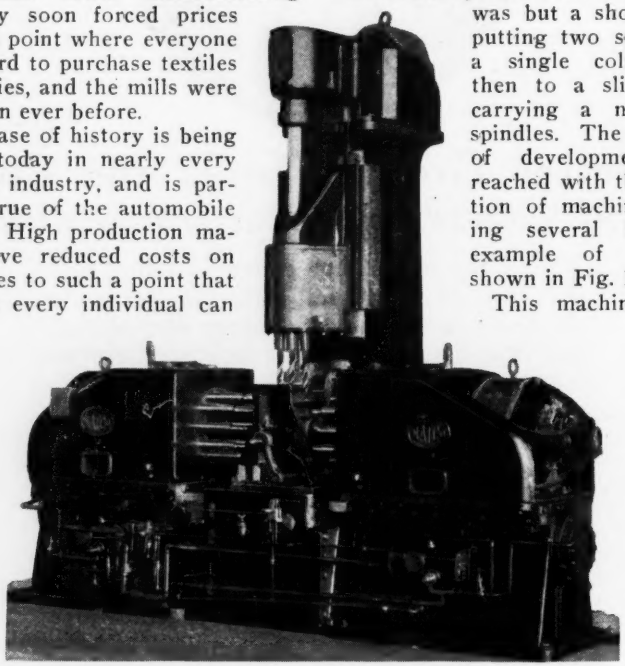


Fig. 1—This machine drills 26 holes in the sides and top of a tractor rear axle housing.

This machine, known as a "three-way driller," consists of a standard machine bed and column to which are added two standard 8-inch and one special 6-inch hydraulic units, the two being horizontal while the special unit is vertical. Each unit is equipped with a motor and

(Photos and data courtesy National Automatic Tool Co.)

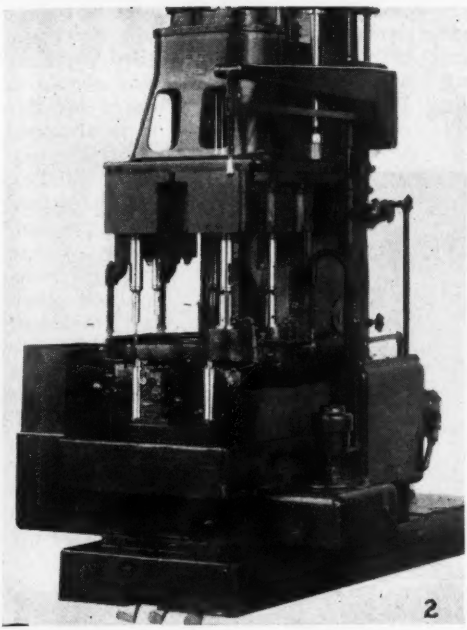


Fig. 2—Drilling and reaming golf club heads at the rate of 120 per hour.

cluster box and is a complete drilling machine, when attached to the supply pump.

The machine as shown is set up to drill twenty-six holes in the two sides and top of a tractor rear axle housing. The right and left-hand heads are each designed with ten adjustable spindles, each of which has a special type nose, for drilling ten holes in each side of the housing. The vertical head is designed with six adjustable spindles, also with adjustable noses, for drilling the six holes in the front of the housing. The operation of the machine is very simple, one lever at the operator's position being all that is necessary to start the machine. The units then go through the complete cycle of rapid traverse forward, slow feed while drilling, rapid traverse to reverse immediately the drills are through, with the heads coming to a stop at the starting position without attention from the operator. Thus the actual work of the operator is reduced to clamping the piece of work in the jigs, moving the control valve, and removing the piece from the jig at the end of the operation. In the meantime he can be operating another machine, or performing hand operations. The machine, set up as shown, drills 110 housings per hour.

The automotive industry, however, is not the only industry in which multiple drilling machines are used. The illustration Fig. 2 shows the center section of a six-spindle machine that is used to drill and ream golf club heads. The machine is equipped with a 12x18-inch head having one fixed center gear-driven cluster box containing six spindles. Each piece of work is clamped into a separate jig, the jigs being located on a 22-inch rotating table. There are seven jigs, so that while the

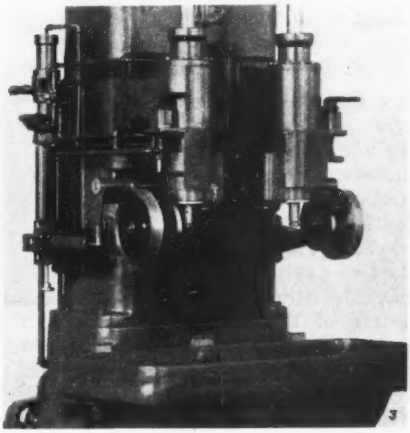


Fig. 3—Two-spindle drill equipped to drill crankshafts for balancing. Either dial can be set so that the drill will stop at the required depth.

six drilling operations are being performed, the operator can be unloading and loading the seventh jig. The operator starts the cycle by pulling the lever which controls the hydraulic mechanism. The head then rapid traverses down to a point at which the points of the drill are just above the work, then the drills feed in to the proper depth, the head rapid traverses back to the starting position, and the machine stops. In the course of the operation each golf club head is drilled by four different sizes of drills and reamed. The production on this piece is 120 pieces per hour.

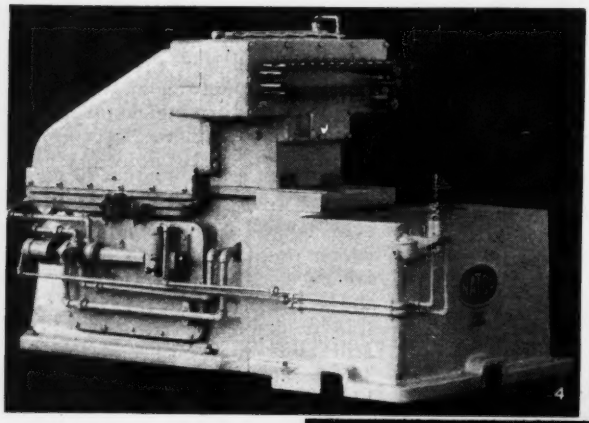
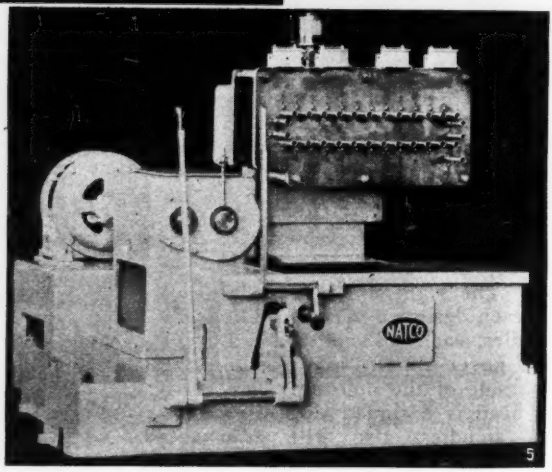


Fig. 4—This machine forms part of the conveyor line. It drills 29 holes in a cylinder block in less than a minute. Fig. 5—The 29 holes are tapped on this machine, each tap being fed by an individual lead screw. Production—60 per hr.



The demand for properly balanced crankshafts in automobiles has fostered the development of sensitive balancing machines, with a consequent demand for machines with which the crankshafts could be drilled correctly and quickly. The machine shown in Fig. 3 is especially designed for this operation. The machine is arranged with two separate motor - driven spindles, with the depth of feed controlled by two graduated dials whose movements are independent of each other After the crankshaft has been placed in position in the jig, the operator sets the dials so that the feeds will be released when each hole has been drilled to the proper depth. Either one or two holes of any depth required can be drilled in a shaft. With a machine of this kind to take care of the drilling, the operator can proceed with the balancing operation on another shaft while the drilling operation is in process.

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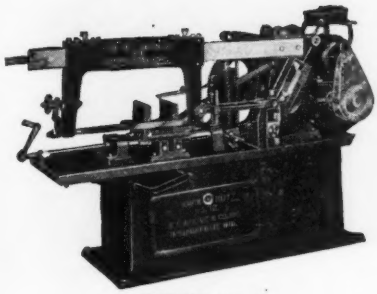
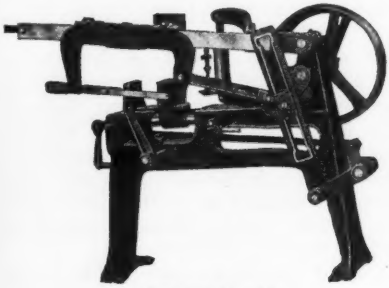


ATKINS No. 18
KWIK-KUT MACHINE



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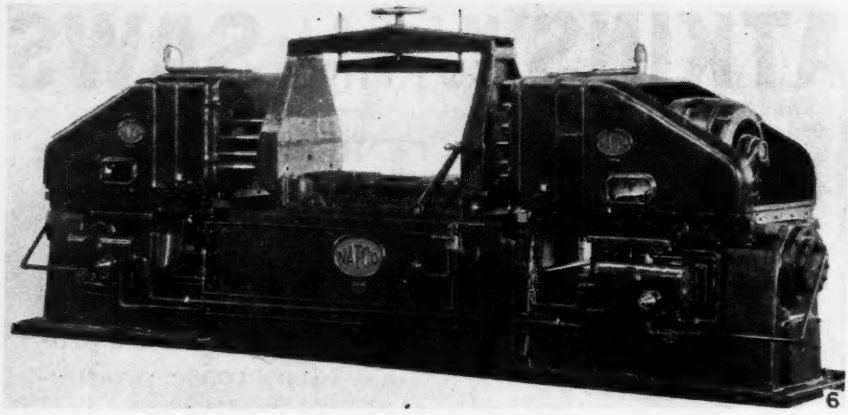


Fig. 6—This machine drills 30 holes in the ends of the block.

modern automobile plant are laid out so that the parts in process can be passed from one operation to the next in the shortest possible time and with a minimum amount of handling. For heavy parts, such as cylinders, conveyors are provided between machines, and in many cases the machine itself becomes a part of the conveyor line. The machines shown in Figs. 4 and 5, which are in use in one of the newest automobile factories, are set into the conveyor line in this manner.

The machine shown in Fig. 4 is arranged to drill twenty-eight ¼-inch holes and one 21/64-inch hole in the water jacket side of a cylinder block. The arrangement of the spindles can be easily seen when there is no work in the machine. The block comes onto the table of the machine from the near side, is locked in position and drilled, and is shoved off the machine table onto the conveyor at the opposite side. The feed of the drills is controlled by the valve at the corner of the machine.

As the block leaves the machine just described, it passes to the machine shown in Fig. 5, where it is again locked into a jig and the twenty-nine holes are tapped. Twenty-eight of the taps are ⅜-18 thd. and the other one is a ⅛-inch std. pipe tap. Each tap is fed by an individual lead screw, however, making it possible to use as many different sizes of taps as may be required. The machine is started by the use of the long lever at the left, the shorter lever being used to stop the machine in case of emergency, such as the breaking of a tap. The block is clamped in position, the holes are tapped, and the block is passed on in less than one minute.

One of the large automobile manufacturers uses the machine and fixture shown in Fig. 6 to drill the ends of the cylinder blocks. The locking device consists of the bar in the top of the fixture, which is quickly set in place by turning the hand-wheel on the lead-screw. The machine is built of two standard hydraulic units with a center section—which serves as a table—to fit the job. The right-hand head carries twenty-two spindles and the left-hand head has eight. When the block is in position, the operator starts the machine by tripping an air-valve which, in turn, controls the oil-valve. When started, the heads move by rapid traverse to position, then proceed at the correct drilling feed

until the drills are clear, finishing by rapid traversing to the starting position again. In case of necessity, the heads can be reversed at any point by reversing the air-valve. The production on this operation is sixty pieces per hour.

A machine which taps both ends and the top of the cylinder block is illustrated in Fig. 7. The machine is built up of frame members which are designed to fit the requirements, to which are added one vertical and two horizontal heads. Thirty holes in the top of the block, twenty-two holes in the front end, and nine holes in the rear end—a total of sixty-one holes tapped in one operation. The machine is powered by a 30 h. p. constant speed motor which drives the main gear or "reversing" box, which in turn drives the heads. The operator starts the machine by moving the handle of an air valve. As power is applied, the spindles start to rotate and feed simultaneously. When the correct depth is reached, the spindles are automatically reversed until the taps are clear of the work, at which point the spindles stop rotating and the heads stop. Each spindle is operated by its individual lead screw, giving all the flexibility desired. This machine, also, can be reversed at any point in case of emergency.

Such equipment is, of course, of practical use only where the very maximum of production is desired, but here is a lesson from manufacturers who have learned that low manufacturing costs can be obtained only by using high-production machinery to reduce the cost per operation.

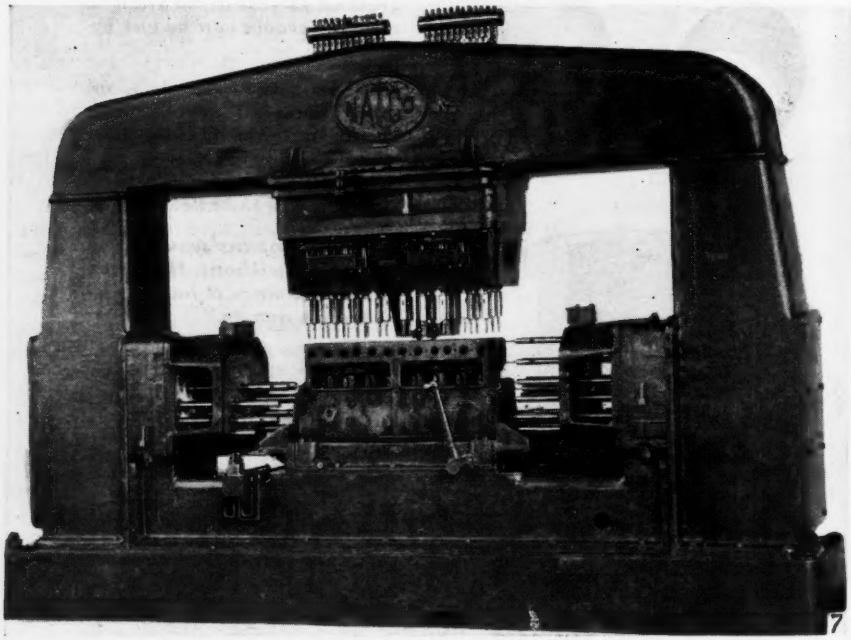
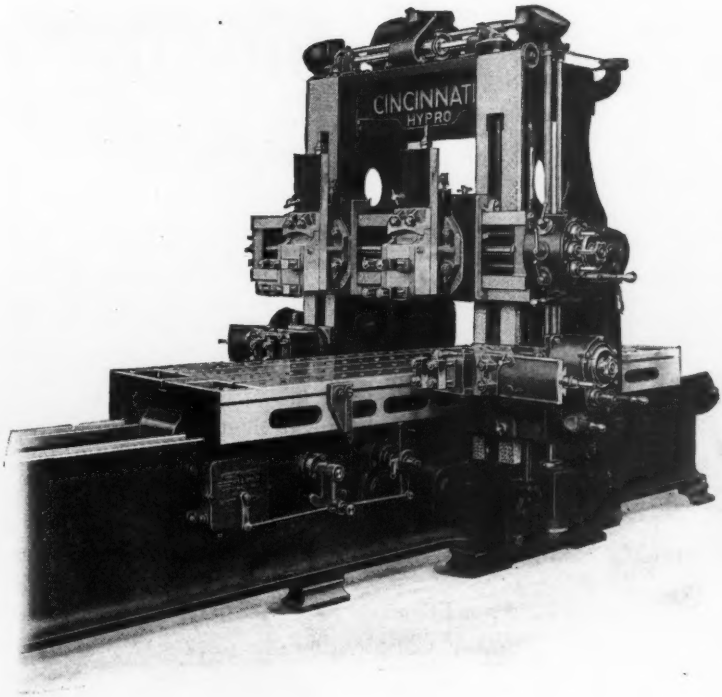


Fig. 7—Sixty-one holes are tapped in a cylinder block in one operation on this machine.

CINCINNATI HYPRO-PLANER



Selective Dial Feed, Instantaneous Rail Lift Rail Clamp, Rapid Traverse and Forced Lubrication are a few of the Leading Features

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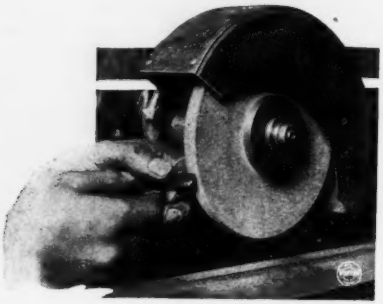
Regrinding of Dull Taps

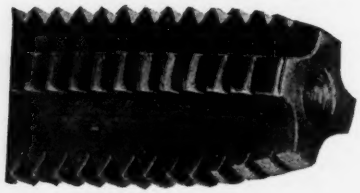
MUCH waste of taps can be avoided by regrinding them. The method is simple. Square the end of a tap on the face of an ordinary tool grinding wheel; grind the relief or chamfer giving it radial clearance of relief. A little skill is required to get a radial relief and keep the cutting edges of the lands even. Radial relief and even height of the lands are the two main things to look out for when



Grinding the relief.

putting an old tap in good condition. The tap should be held lightly against the face with the grinding wheel turning toward the cutting edge of the tool. This gives a slightly better edge, free from burrs, than if the wheel were running in the opposite direction.

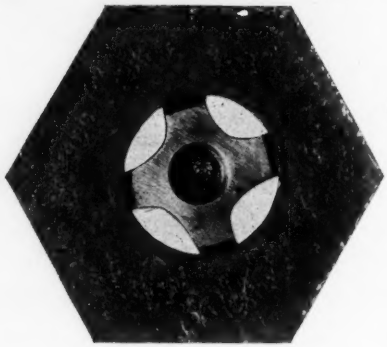
The tap must be held firmly enough that it will not accidentally turn and carry the cutting edge against the wheel, thus grinding it off. The operator should keep turning the tap slightly so that a little more will be ground off the back of the tooth and a radial relief will be obtained. There is always more or less danger of drawing the temper, therefore particular attention should be given to



Relief after grinding.

bearing lightly when grinding, and to use a free and cool-cutting wheel.

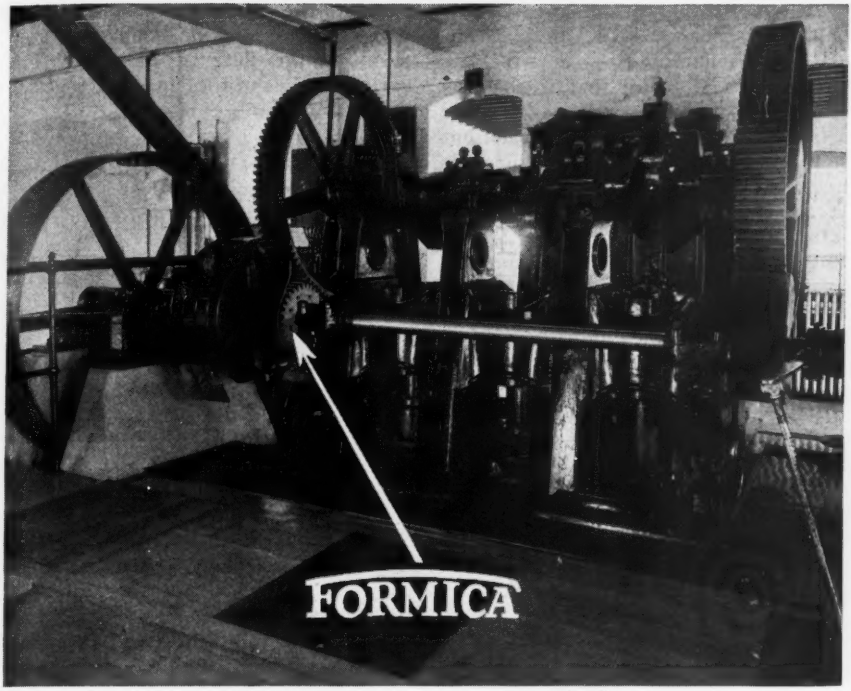
The second important thing to look out for is that all the lands are left even—the same radial height. If they are not even, the tap will not start true. A good method of testing a tap to find if the lands are even is to turn it about two-thirds through a nut and look at it from the opposite end. It can readily be seen whether or not all the lands are at work. The length of the relief should be considered. Ordinary plug taps



Testing the lands.

are made with a chamfer tapered four or five teeth back.

A paper read by Mr. F. O. Wells,



Formica Pinions In Large Water Pumps

This water pump in the water works of Hingham, Massachusetts was extremely noisy until it was silenced recently by the installation of Formica pinions.

A hundred horse power oil engine drives the pump shown in the picture. In the same building a smaller pump driven by a 75 horse power engine has also been silenced with Formica.

Everywhere a demand for quieter machinery has made Formica popular. Gear cutters in all parts of the country carry Formica in stock and cut and deliver gears promptly on order.

THE FORMICA INSULATION CO.

4632 Spring Grove Avenue CINCINNATI, OHIO

FORMICA

of Wells Brothers Company, Greenfield, Mass., before the American Society of Mechanical Engineers in 1912, cites a test showing that it requires about 25 per cent more power to drive a tap which has been ground back but four threads than for one which has been ground back six threads. The former has 16 cutting teeth and the latter 24. The latter with its 24 cutting teeth also produces much smoother threads and cuts more closely to size.

The relief becomes dull first, and as a general thing sharpening is necessary only on the relief. A very little grinding here will resharpen the tap; however, it is not unusual for the cutting edges of the teeth to become dull, nicked or burred, in which case it is necessary to grind in the flutes. The

Grinding flute of gun tap.

customary method of grinding small taps is to hold the tap by hand and pass it under the wheel, merely touching the cutting edges of the teeth against the grinding surface. The wheel face should be shaped to conform to the flute of the tap. The various makes of tool and cutter grinding machines provide means for holding taps for flute grinding. In grinding the flute, extreme caution must be exercised not to change the temper of the steel; the cutting edge being very thin, there is danger of ruining the tap. The danger is practically eliminated, however, by a very light pressure and the use of a cool-cutting Alundum wheel.

Squaring off end.

A broken tooth in a tap does not make the tap useless. As a matter of fact, if all pieces of the broken tooth are carefully ground out, leaving no jagged edges to tear the thread, the efficiency of the tap as a threading tool has been reduced but very slightly.

Taps should usually be re-sharpened after having tapped 500 holes. The length of time that a tap may be used before becoming dull, however, depends upon the kind of work on which it is being used.

(From "Tool Room Grinding," published by Norton Company.)

The bootlegger is all right in his place—until it is raided.

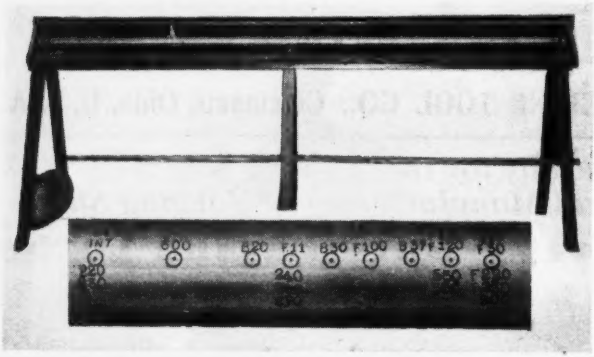
Ideas From Readers

This department is a clearing-house for ideas. If there are any "kinks" or short-cuts in use in your shop, send in a description of it. We will pay $5 for each one published.

Tram-Gauge For Rod Work

By M. J. BRUSH

In order to save time in setting trams for main and side rod work, we use a gauge that is made of 3-inch shafting, 10 feet long. Using a center-punch mark near one end of the shaft as a point to work from, the dimensions of all the different sizes of rods for all different classes of engines are marked off and indicated by punch marks with the engine classifications stamped in the rod at each punch-mark. The gauge has saved its cost many times over and simplifies the work of setting a tram accurately. The gauge is kept in a box that is supported at a convenient height, as shown in the photograph. A cover on the box keeps the dirt out and keeps the gauge clean.



Above—Tram-gauge for rod-work in its case. Below—Section of rod, showing the engine classification marks.

Saving Time On Break-Downs

By TOM J. O'REILLY

How many times I have seen the millwright or belt repairman take the slack out of a loose belt by removing the pin, cutting a couple of inches off one end of the belt, and relacing that end so that the belt could be joined again. This procedure usually takes from 10 minutes to half an hour, during which time the machine and operator are standing idle.

The belt repairman in our shop has eliminated most of this waste time by the use of a system, the main feature of which is that it allows him to do all his belt lacing while the belts are running. In his spare time he has made up a number of "inserts," consisting of sections of different widths of belting 4, 6 and 8 inches long. Each insert is laced at both ends. When a new belt is put on a machine, instead of cutting it the correct length, he cuts it 8 inches short and puts in one of these inserts. When the belt has stretched enough to become loose, he takes out the 8-inch insert and puts in a 6-inch one.

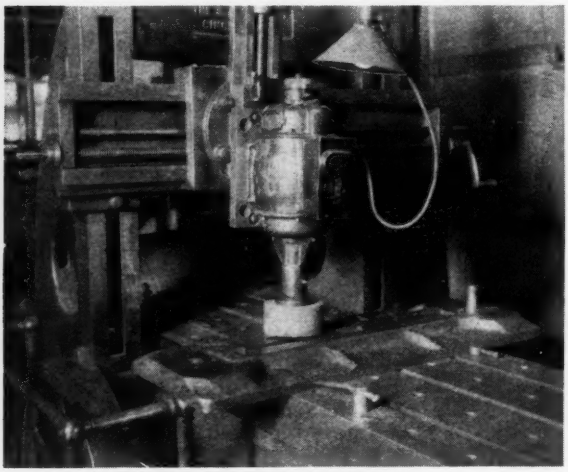
He keeps a card record of each machine in the shop, on which is tabulated the widths of all the belts

used on the machine, together with the dates that repairs are made and a record of the repair. When an order comes to take the slack out of a belt, he looks on the record to see what length insert was put in last, then takes an insert of the next shorter length and starts for the machine. It takes only a couple of minutes to change the insert and the machine is ready to run again. His record also gives him valuable information as to the qualities of different makes of belting, length of life of belts on the various machines, and so on.

Grinding Dies On a Planer

By S. ECKERT

In the manufacture of the Globe-Wernicke products, a number of dies are used which are too large to be put into the surface-grinding machine for grinding. In order to perform this very necessary operation, a U. S. Electrical Tool Co. grinder



Grinding a die with a "U. S." grinder.

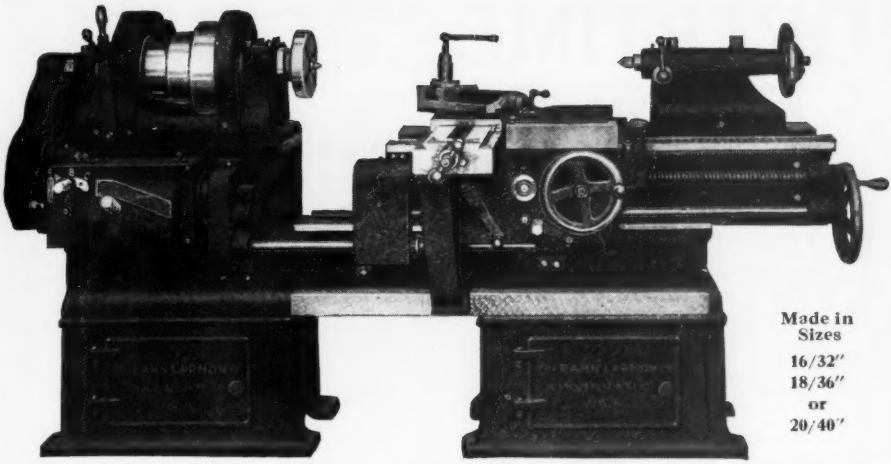
was bolted to the toolhead of a planer as shown in the illustration. A 6-inch cup wheel is used, and the tool is aligned so that the spindle of the grinder will be at a 3-degree angle with a vertical line. Experience has taught that better results can be obtained by setting the grinder at this angle than by setting it perpendicular. By using a cross-feed of .040 inch per cut, a nice job is produced.

Using Three Belts—Discussion

On page 46, July number of MODERN MACHINE SHOP, Mr. Frank R. Hynes furnishes some interesting information on belt driven lathes, concerning using the backing pulley for additional forward speeds by putting a second forward belt on the reverse pulley.

The author has seen this practice followed where no reverse belt was used, both pulleys being used for forward speeds. On medium and large lathes the backing belt may not be seriously missed if a lead screw indicator is attached to the carriage.

The last sentence of Mr. Hynes' article is particularly impressive, i. e., "It is remarkable how much more a belt will pull with a larger cone and faster speed." It has been the writer's experience as a lathe hand that too many belt driven lathes have countershafts speeded to allow a medium or even slow cutting speed on full swing size work. Where there are several lathes of various sizes in a shop it is not usual to turn job of full swing size in any machine; the tendency is to put the work in a larger machine. In this way the



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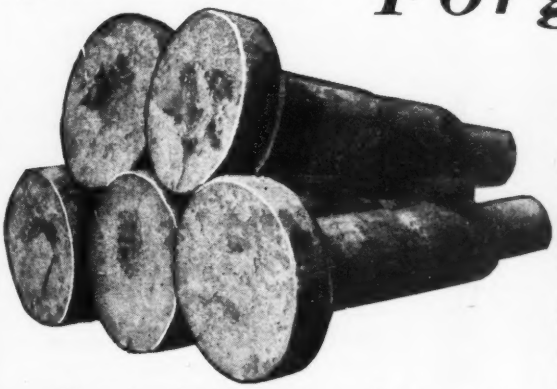

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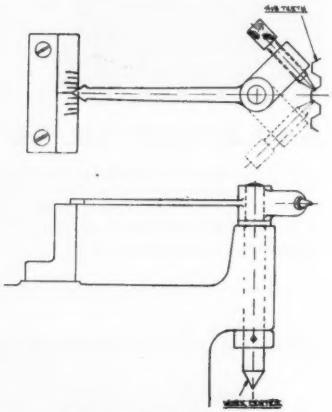
advantage of using the larger pulleys, as suggested by Mr. Hynes, will be gained.

"BACKWOODS MECHANIC."

Gauge For Setting Hobs

By H. C. KLINE

When setting a hob, the operator usually locates the cutter somewhere near the center and machines a sample piece, which is checked to determine how far the tooth is off. The hob is then moved over to compensate for



Gauge for setting hobs.

this error and the operation is repeated. This cut-and-try method is frequently a lengthy affair, and naturally increases the set-up cost on every job done on the machine.

The device shown in the drawing was designed to center the tool accurately in a few minutes, and consists of a pointer arm which is placed on the work center, and a block graduated to indicate the position of the cutter tooth. The hob is set as closely as possible by eye and is then adjusted until the pointer locates at zero, both in the position shown and when reversed. The thumb-screw accommodates various tooth thicknesses, and

(*Continued on page* 55)

MODERN Machine Shop

Published Monthly at
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By
DON G. GARDNER - - - - *Publisher*
HOWARD CAMPBELL - - - - *Editor*

Exit Gloom

Black paint in the machine shop is a tradition. So also is dirt. Undoubtedly the black paint was originally intended to lower the visibility of the dirt, although no one was ever really fooled by it, while the black paint, shavings, iron dust, and grease combined to create an environment that everyone was glad to get away from at the end of the day.

However, an interesting change is taking place in the general attitude toward dirt in the shops and factories, one feature of which is the change in attitude toward the use of colors on machinery. Instead of the traditional black, a number of plants are found in which the machines are painted with colors that show the dirt and grease. In one of the new railway shops in Texas all machines are painted maroon. A large parts manufacturing plant in Indiana has all of its new machinery painted blue, and eventually all of the hundreds of machines in this plant will be of the same color. The extreme is reached in a large automobile plant in Pontiac, Michigan, where every machine in the shop is white.

The idea that the brighter colors are harder to keep clean is a fallacy; they are easier to keep clean, because they show the dirt instead of hiding it. And an interesting color on a machine is, in itself, an invitation to keep the machine clean. A little extra money invested in the interest of cleanliness will bring back big returns in the shape of better care of the machinery and equipment, better workmanship, and a better organization spirit.

The Small Shop

An old-time machine shop superintendent recently remarked to this editor that "business is passing into the hands of a few large plants. In a few years there won't be any small shops left." We have heard that statement before, and we don't agree with it.

This is a mechanical age. We get out of bed at the urge of a mechanical alarm, turn a switch to start a mechanically-operated furnace, dress in machine-made clothes, ride to work in a mechanically-operated vehicle, dictate to a stenographer who takes her notes with a mechanical pencil, and sign letters that were written on a mechanical writing machine. We spend the evening watching mechanically-operated pictures, and end the day listening to music that is brought to us by a mechanical receiving set.

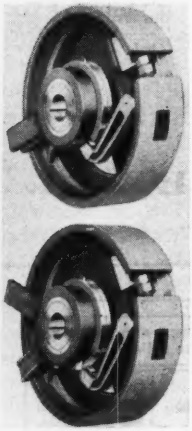
Each one of these activities involves the use of equipment that was produced in a machine shop, and not all of the shops are large. None of the equipment is built complete in one plant; many of the parts are purchased from other firms—often small shops—and most of them are produced by the use of special tools, jigs, or fixtures which often are built by small tool shops. At the present moment the editor knows of two "contract" shops in Indiana and one in Ohio which are building additions and enlarging their facilities in order to take care of increased orders for parts and tools.

There are more small shops today than ever before. The more progressive ones may grow up, but there will always be others to take their places.

New Shop Equipment

Conway K O Expansion Clutch

The illustration shows the Conway Expansion One Revolution and Knock-out Clutch, which has been placed on the market by the Conway Clutch Company, 1959 West Sixth Street, Cincinnati, Ohio. The feature of this clutch is that it can be set to perform at one or any fixed number of revolutions, or at half revolutions, and at slow speed. It can also be applied by spring treadle to respond to any desired stop.

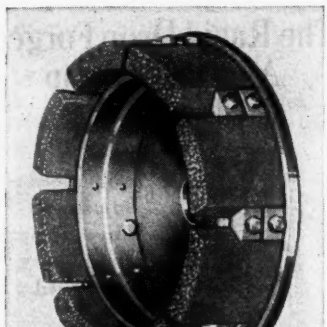


Conway K. O. Expansion Clutch.

The clutch comprises the standard full floating friction band, latch and carrier of the expansion clutch, the lever being altered in construction only to carry the ball-bearing roller operated by the engagement and release cams. Without brake, the clutch should be operated at speeds of from 50 to 80 r.p.m., but with brake the clutch can be operated at speeds up to 150 r.p.m. The clutch is practically enclosed in its own drum, has unusual power capacity, easy engagement, quick release, drag-free idling and handy one-point adjustment. The Conway K O expansion clutch is made in sizes of 8, 10, 12 and 15 inches, with carrying capacity of 4, 7, 9 and 14 h. p., figured at 100 r. p. m.

Rogers Segment Grinding Wheel Chuck

To facilitate faster and cooler grinding with Rogers knife grinders, Samuel C. Rogers & Company, Buffalo, New York, are announcing a new steel segment grinding wheel chuck. The outstanding feature of the chuck is simplicity of construction, the chuck being so designed that it can be used on face and surface grinders of any make. The chuck is 14 inches in diameter with 8 segments 4x4x1¼ inches mounted in a strong, carefully machined chuck with simple adjustable parts for holding and replacing the segments. The parts consist of the inner ring of the chuck and two



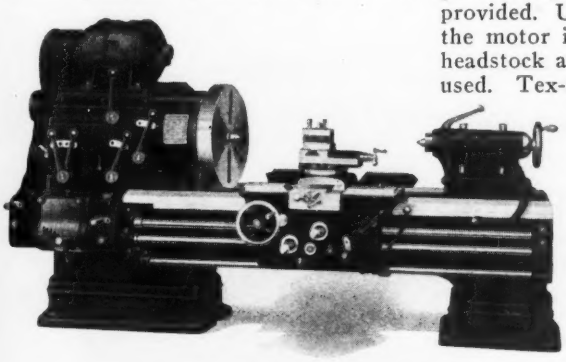
Rogers Segment Grinding Wheel Chuck

sets of clamping wedges. When the segments are worn half way down, the cutter wedges and inner ring are removed and the use of the wheel is continued until the segments are com-

pletely used up. Then the last row of clamping wedges are loosened, the butts of the segments removed, new ones inserted and both rows of clamping wedges replaced. The wheel is protected with a guard which can be adjusted to conform with the wearing of the segments. The weight complete with segments is about 60 pounds. The chuck is made in six standard sizes, 12, 14, 16, 18, 20 and 22 inch.

Monarch 30-Inch Heavy Duty Lathe

The Monarch Machine Tool Co., Sidney, Ohio, has placed on the market an improved design of its 30-inch, helical gear, heavy duty engine lathe,



Monarch 30-Inch Heavy Duty Lathe.

in which all headstock bearings, including the spindle and gear-box bearings, are Timken tapered roller bearings. The swing of the lathe over the bed is 31½ inches, and the swing over the carriage is 22 inches. Sixteen spindle speeds are available through 14 high carbon alloy steel hardened and ground gears which are located in the headstock. Speed changes are made by double-jaw clutches sliding on splined shafts, actuated by means of four levers located on the front of the headstock.

The speed change arrangement is so designed as to eliminate the possibility of engaging conflicting gears. By mounting the spindle and headstock shafts in Timken bearings, the amount of power delivered to the tool is increased to the maximum, greater precision is obtainable, and the tendency to leave tool-marks in the work is minimized. The headstock oiling system is of the splash type. A special design multiple disc driving clutch with a brake is provided, and is arranged so that it can be operated from either the headstock or the apron.

The apron is a complete box section with the apron gears running in an oil bath. The rack pinion is mounted on anti-friction bearings, and special patented apron friction feed levers are provided. Unless otherwise specified, the motor is mounted on top of the headstock and a silent chain drive is used. Tex-rope or gear drive is optional. For ordinary service, a motor of 10 to 15 h. p. is recommended. The quick-change gears permit the cutting of a full range of threads from ¾ inch to 46 threads per inch. The spindle speed range with the driving pulley running at 500 r. p. m. is from 6 to 303 r. p. m.

Apex Tap Chuck

Several types of chucks for multiple tapping, both positive and friction drive, have recently been added to the line of drilling and tapping chucks manufactured by the Apex Machine Company, 300 Davis Avenue, Dayton, Ohio. The vertical float positive drive chucks are made in two styles, with compression spring for power and lead screw feet, and tension spring for hand feed.

A photograph of the vertical float

friction drive chuck for tapping bottom holes and tough metals is shown herewith. The friction is set to slip before the breaking point of the tap is

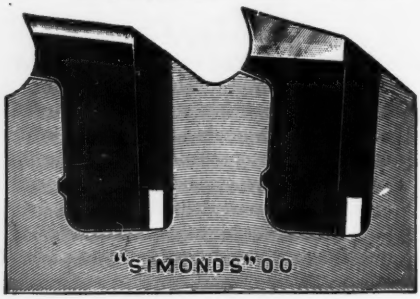
Apex Tap Chuck.

reached so that if the tap sticks or strikes bottom, the friction will slip and the tap will be saved from breaking. The float compensates for the spindle travel.

The spindle thrust does not in any way affect the friction. Quick change free floating tap collets are used, insuring true tapped holes. The chuck is made in two sizes, Type MA, having a capacity of 3/8 inch, and MB, capacity 3/4 inch. The outside diameters are 1 1/16 and 1 7/8 inch respectively.

Simonds Inserted Tooth Metal Saw

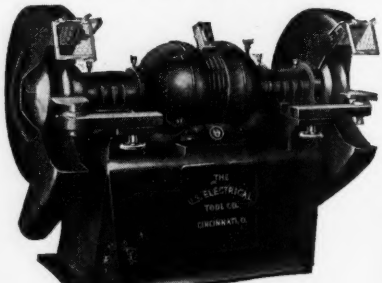
The illustration shows a section of a new type of inserted tooth metal saw which has been developed by the Simonds Saw & Steel Company, Fitchburg, Mass., and Chicago, Ill. The saw is designed to give a maximum of cutting speed and efficiency. The teeth are made of high speed steel and every tooth is rounded on top and is slightly higher than the alternate teeth. It is intended that the round top tooth shall first engage the work and cut a groove, the square top tooth following through and cleaning out the corners of the cut. Another feature which is intended to make the saw faster is the new curved gullets which eliminate the danger of metal chips becoming welded on the teeth and causing possible damage to the saw and machine. The use of high speed steel teeth with a plate of tough alloy steel is intended to give all of the advantages of high speed steel. At the same time this type of saw will make a cut as narrow as the usual selected saw. The teeth can be sharpened without removing from the plate, and can easily be renewed or replaced when worn out.



Simonds Inserted Tooth Metal Saw

U. S. Hispeed Snagger

A new machine especially designed and built for high speed grinding and snagging has been introduced by its makers, The United States Electrical Tool Co., 2488 West Sixth Street, Cincinnati, Ohio. A surface speed of 9,500 feet per min. is obtained on this machine with wheels 30 inches in diameter, having 2½-inch or 3-inch face, 18-inch hole, and operating on 40 to 60 cycle. When worn down to 24 inches diameter, the wheels turn at 7,500 surface feet per minute, or an average of 8,500 feet per min. On 25



U. S. Hispeed Snagger

(*Continued from page* 48)

should be designed in correct relation to the pointer so that it strikes the tooth in the same plane when the arm is turned over.

Although the sketch shows a gauge made for a horizontal machine, the idea can easily be adapted to the vertical type by altering the design to suit the conditions.

Mention MODERN MACHINE SHOP when writing advertisers.

and 50 cycle circuits, 24-inch wheels with 2½ or 3-inch face and 12-inch hole are recommended, giving a surface speed of 9,200 feet. This machine is furnished for 220, 440, 550 volts, 2 or 3-phase alternating current, and 220 volts direct current.

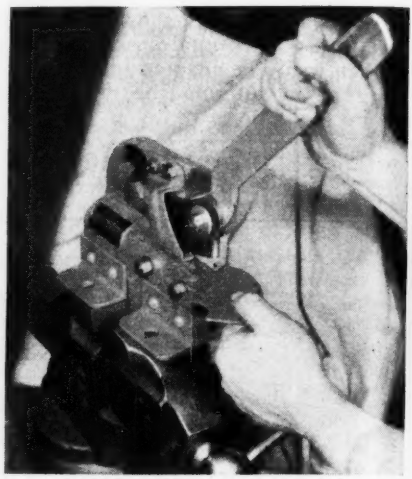
The motor is 15 h. p., designed for heavy duty grinding service, and built to A. I. E. E. specifications. It is rated for continuous service at full horse power with a temperature rise of 40 degrees, and with a momentary overload capacity of more than 100 per cent.

The U. S. Hispeed Snagger is built to the American Engineering Standard code of safety. The wheel flanges are keyed to the shaft and securely clamped to the wheel by cap screws. Structural steel safety hoods over the wheels are built for wheel speeds of 10,000 surface feet per min., and the doors on the safety hoods are fastened on by cap screws. The shaft is of nickel steel, in one piece, and mounted on four heavy duty ball bearings in dust-proof housings. The machine is designed to deliver a maximum of service, and is of rugged construction throughout.

National Machine Company "Handnib"

In order to cut down the time of making templete patterns and sheet metal gauges, the National Machine Tool Company, 1536 Clark Street, Racine, Wis., has brought out a tool called the "Handnib," shown in the illustration. A short, quick down stroke operates the machine, which is so designed that the sheared portions of any width material will clear the machine. The concave cutting knife will shear any circular line, and the semi-circular punch cuts out the corners.

The machine is of all steel construction, can be easily carried and is designed to fit into any vise. The shear plates are of tool steel and can



National Machine Co. "Handnib"

be easily removed for sharpening. The length of blade is 4½ in., capacity of shear ⅛ in. flat stock. Capacity of rod cutter $\frac{5}{16}$ in. round stock, weight 13 pounds.

(*Continued from page* 30)

the knowledge that the ideas contained in the bulletins were, in most cases, presented by the department heads themselves.

The question that will arise in the minds of many executives who read this article is "What net results are secured through such a training course as the one outlined above?" Armco officials state that the foremen's conferences have developed a spirit of loyalty and co-operation which is invaluable and have given both the officials and the workmen an understanding of each other's problems which could be obtained in practically no other way.

Check For Information Wanted

If you are interested in prices or information on any of the equipment listed, check the item, tear out the page, write your name, firm name, title and address on the margin and send it to MODERN MACHINE SHOP, 128 Opera Place, Cincinnati, Ohio. We will see that you are supplied with the information desired. Please limit your request to not more than ten.

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- ☐ Lathes, Turret
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- ☐ Lathes, Gap
- ☐ Lathes, Polishing
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- ☐ Presses, Punch
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- ☐ Punches, Hand
- ☐ Punches, Power
- ☐ Racks, Cut
- ☐ Reamer Holders
- ☐ Reamers, Adjustable
- ☐ Reamers, Solid
- ☐ Riveting Machines
- ☐ Rules, Steel and Wood
- ☐ Rust Preventatives
- ☐ Saws, Metal
- ☐ Saw Frames and Blades
- ☐ Sawing Machines, Metal, Power
- ☐ Saws, Band
- ☐ Saws, Milling
- ☐ Scales, Machinists'
- ☐ Screw Machines, Automatic
- ☐ Screw Machines, Hand
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- ☐ Shafts, Flexible
- ☐ Shapers
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- ☐ Wrenches, Drop-Forged
- ☐ Wrenches, Pipe
- ☐ Wrenches, Ratchet
- ☐ Wrenches, Tap

(Continued from page 24)

of a pen which draws a red line on a sheet of paper. One of the records is reproduced in Fig. 11. The record shows the eccentricity of the pitch line, if any, the spacing of the teeth, and the rolling action. There are twenty-six machines cutting internal gears, each of which is checked three times a day, or at every seventh gear.

The finished gears are hardened in electric furnaces of the type shown in Fig. 12. In order to keep the furnaces segregated from the surrounding machinery and also to facilitate handling, the furnaces are arranged in four groups of thirteen furnaces to a group. A pyrometer located over each furnace keeps the operator posted as to just what is taking place in the furnace. As each gear-cluster begins to heat, the temperature is recorded by a pen on a moving sheet of paper. The heating process is slow at first, gradually accelerating until the point is reached at which the molecular structure of the steel changes, known to metallurgists as the "critical point." While this change is taking place, a marked contraction takes place in the steel, after which the steel expands again. As the steel heats, the line on the chart becomes more vertical and when the structural change takes place, the pen moves down again for a short space, making a "hump" in the line. The operator bases his operations on this hump, and at a given time after the hump has appeared, he pulls the cluster out of the furnace and quenches it, thus practically "freezing" the metal while it is in this refined state, and retaining the fine, close grain in the steel. Twenty clusters per hour are hardened in each furnace.

For Your Catalog Library

Check any of these useful publications that you want, write your name, firm name, title, and address on the margin, then tear out the page and send to Modern Machine Shop, 128 Opera Place, Cincinnati, Ohio. They will be forwarded to you promptly without cost or obligation. Please restrict your list to not more than ten.

Turret Lathes and Tools: Illustrated book describing Cincinnati Acme Turret Lathes and Screw Machines, and showing a variety of tools and fixtures for use with these machines. The Acme Machine Tool Co., 4955 Spring Grove Ave., Cincinnati, Ohio.

Scraping By Power: Bearing surfaces can now be scraped with a power scraper that is quicker and easier than the old-fashioned hand method. The tool is described in a folder that is issued by Anderson Bros. Mfg. Co., Rockford, Ill. Sent free on request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Metal and Wood Saws: Catalog No. 20 describing saws of all kinds, for both metal and wood. 256 pages of descriptions of saws and sawing machinery. E. C. Atkins & Co., 402 S. Illinois St., Indianapolis, Ind.

Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills, and horizontal drilling machines, has been issued by the W. F. & John Barnes Co., Rockford, Ill.

Bowsher Balancing Way: Gears, pulleys, fly-wheels, emery wheels, and other rotating parts should be properly balanced. This work can be done quickly and accurately on a balancing way that is described in a bulletin issued by The N. P. Bowsher Co., South Bend, Indiana.

"The Lathe With the Longer Life" is the title of a bulletin that describes the Coneless Lathes made by the Boye & Emmes Machine Tool Co., 2247 Spring Grove Ave., Cincinnati, Ohio.

Bradford Unit Type Drill Heads and Tapping Heads are described and illustrated in a bulletin published by the Bradford Machine Tool Co., Cincinnati, Ohio. The bulletin also describes useful applications of these heads.

Combination Punches, Slitting Shears and Bar-Cutters. Two new large all-steel universal combination punches, slitting shears, and bar-cutters are described and illustrated in the new bulletin No. 325, published by Buffalo Forge Company, 446 Broadway, New York.

Brent Buys Radial Drills: A story of the methods used by a plant executive to determine what type of machine is best suited to his purpose. Published by The Cincinnati Bickford Tool Co., Oakley, Cincinnati, Ohio.

Gear Data: The Cincinnati Gear Co., Cincinnati, Ohio, has published Catalog D, which describes and illustrates the various type and kinds of gears made by this firm. The book contains photographs of the plant departments, with descriptions of the equipment employed, and also includes a number of pages of valuable data and reference tables for machine shop use.

Rapid Traverse Planers: Cincinnati Hypro Planers, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

Shaper Progress: An illustrated catalog describing the various types of shapers made by the Cincinnati Shaper Co., Cincinnati, Ohio, and including descriptions of Cincinnati Shapers in use in different kinds of plants.

"The Lathe With the Pull" is the title of a catalog that has been published by the Cisco Machine Tool Co., 1765 Elmore St., Cincinnati, Ohio. The book describes the engine lathes, polishing lathes, and radial drill presses made by this firm.

Handbook For Drillers: The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock-Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears.

Fosdick Drills: This publication gives details as to the design and construction of Fosdick Radial, Upright, and Sensitive Drills. Published by the Fosdick Machine Tool Co., Cincinnati, Ohio.

Quick-Acting Clamp: A bulletin describing the "Rapid" drop-forged steel clamp manufactured by the Fountain Equipment & Mfg. Co., 2025 Elm St., Cincinnati, Ohio, has been issued by this firm.

Machinists' Tool Cases and Chests: The high grade tool cases and tool chests manufactured by H. Gerstner & Sons, 1254 Columbia St., Dayton, Ohio, are described in detail in catalog No. 27, which can be had by writing to this company.

Greaves-Klusman Lathes: A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klusman Tool Co., Oakley, Cincinnati, Ohio.

Drilling and Grinding Electrically: Catalog M, showing and describing a variety of modern electric portable drills, grinders, and other tools, including floor grinders and buffers, has been issued by The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, Ohio.

Automatic Lathe Operation: The new Catalog No. 16, which has been published by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, describes the construction and operation of the LeBlond No. 16 Heavy Duty Automatic Lathe. A number of tooling layouts for use with this lathe are also shown.

Lehmann Lathes: Details of the outstanding features of Lehmann Lathes are given in a catalog published by the Lehmann Machine Co., 3560 Chouteau Av., St. Louis, Missouri.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

Modern Lathe Design: A bulletin describing and illustrating the features of the Monarch 16-speed Helical Geared Timkenized Lathe has been published by The Monarch Machine Tool Co., Sidney, Ohio.

Roller Bearing Radial Drills: The application of Timken roller bearings in the design of modern radial drilling machines is discussed in a bulletin describing "Mor"-Speed Radial Drills, published by the Morris Machine Tool Co., Cincinnati, Ohio.

An Outline of Economical Small Drilling: The subject of small-hole drilling is discussed in a booklet that is published by Adolph Muehlmatt, Fifth and Elm Sts., S. E., Cincinnati, Ohio. The booklet also describes the outstanding features in the construction of the A. M. Sensitive Drilling Machine.

"The 'Hole' Story In One Word" is the title of a publication that has been issued by The National Automatic Tool Co., Richmond, Ind. The book gives details as to construction and uses of "Natco" multiple drilling and tapping machines.

Milling Internal Keyways: A simple method of milling keyways in gears, wheel hubs, and other similar parts with the aid of a drill press and a special tool is explained in a booklet that is published by the National Machine Tool Co., 2272 Spring Grove Ave., Cincinnati, Ohio.

"Tool Room Grinding" tells how to sharpen milling cutters and how to grind drills, taps, reamers, lathe and planer tools, and dies. A number of drawings and photographs are shown, showing how to hold the tools for grinding, and the kinds of chips that should be produced by properly-ground tools, etc. Published by Norton Co., Worcester, Mass.

"Offset" Milling: A booklet that explains the offset principle of continuous milling and describes the applications of this method will be sent free to executives who address The Oesterlein Machine Co., 3301 Colerain Ave., Cincinnati, Ohio.

Engine, Turret, and Gap Lathes are described in a series of bulletins that have been issued by **The Rahn-Larmon Co., 2943 Spring Grove Ave., Cincinnati, Ohio.**

Engineering and Manufacturing Service: A complete engineering and manufacturing service for manufacturers who are not equipped to handle all of their own designing, experimental, or production work is described, with illustrations of the equipment available, in a bulletin that is issued by The Steel Products Engineering Co., Springfield, Ohio.

Saving Time With Small Tools: A line of time-saving small tools, including "Use-Em-Up" drill sleeves, "Wear-Ever" chucks, collets, cutters, reamer and tap holders, counterbores, spotfacers, and other tools is described in Catalog 36, issued by Scully-Jones & Co., 1901 S. Rockwell St., Chicago, Ill.

Multiple Drilling With a Single-Spindle Drill: Methods by which multiple drilling may be done on a single-spindle drill, using multiple spindle drill heads, are discussed in a bulletin that is issued by The United States Drill Head Co., 1954 Riverside Drive, Cincinnati, Ohio.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 24, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Thanks For the Flowers!

There is nothing in the world that will spur a man on to greater effort like the knowledge that what he is doing is appreciated. And we are just as human as anyone else in that respect. Every mail brings us letters and coupons bearing messages like these:

"Wish to thank you for the June copy received. It was read from cover to cover with great interest."—CARL J. LANG, General Manager, Lang Manufacturing Works.

"I find a lot of GOOD THINGS, and good ways of doing things, in your MODERN MACHINE SHOP, *and look forward to it each month."*—FRED E. RIPLEY, Adams, New York.

"Would like to say that your magazine is 'chuck' full of good material."—C. H. HAYS, Machine Shop Superintendent, Engelen Electric Co.

No language can adequately express our thanks for these messages of goodwill and appreciation. We can only say that they have been an inspiration to our entire staff, and will be reflected in redoubled efforts to serve the industry in the best manner possible.

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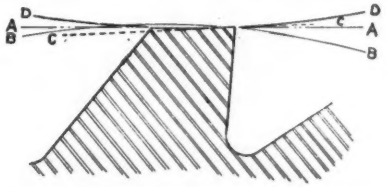
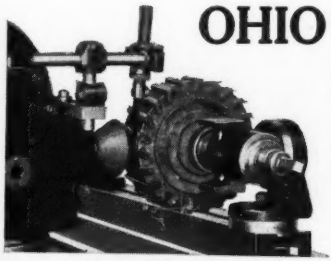
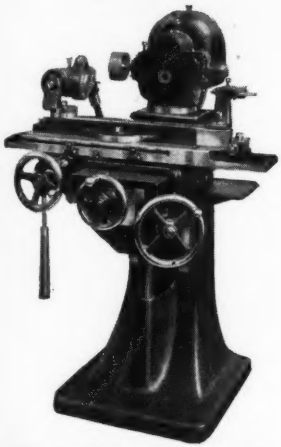
Cutting tools last longer—cut better—when properly ground



DD represents periphery of grinding wheel, BB circumference of cutter, AA desired clearance as obtained with cup wheel on Ohio Grinder, CC clearance angle obtained using periphery of grinding wheel for clearance.



Sharpening the Periphery of an Inserted Tooth Face Mill.



No. 2 Ohio Universal and Tool Grinder, Motor Driven, Forced Feed Table Lubrication.

OHIO Grinders preserve cutter life by correct grinding

MANY cutters pass their stage of usefulness prematurely due to incorrect grinding, but proper grinding costs no more than any other.

Ohio Grinders produce a solid backed cutting edge that has double the life of any hollow one.

The added life given to cutters is actually a saving in cutter investment. These small savings mount rapidly and soon pay for your machine.

It's just as easy to make your tools do more work for less cost, even though the initial investment may be a trifle more.

The sketch above shows the difference between right and wrong grinding of face mills. The illustration at the left, correct set-up on an Ohio Grinder.

You can get a complete story on tool grinding from our booklet "E." Write for your copy today.

The Oesterlein Machine Co.

3319 Colerain Ave., Cincinnati, Ohio, U. S. A.

Riff-Raff Ravings

By GEO. ALEXANDER MANN
Raver-in-Chief

AW HAW—THAT'S THA ?

I ask you—how much o' the time that you've been with the boss have you worked for him?

His steno. has went,
She quit him for life,
She says that she caught him,
A kissin' his wife.

If the average business man talked the way his letters read he'd be nabbed for lunacy.

Woman's intuition don't prevent her askin' a lotta dam phool questions.

POOR GUS

Absent minded Gus,
Is in an awful plight,
He put out his wife,
An' kissed the cat good night.

Minister: "I shall now tell the parable of the good little girl."
Aged Five: "Good for what?"

Goin' from "marriage" to "trial marriage" is simply lengthenin' the word an' shortenin' the sentence.

YOU KNOW 'EM

Next to the clock watchers in the office come the whistle listeners in the shop.

AIN'T THA RADIO GRAND?

Yuh tune aroun' all evenin',
With bleedin' ears yuh stop,
All yuh hear is fiddlers
An' yawpin' tenors yawp.

Poor paw is in bad,
He took on a "souse"
He found the right key,
But got the wrong house.

Visitor (at insane asylum to trusty): "I say, old man, is that clock right?"
Trusty: "Well, it couldn't be right or it wouldn't be here."

Connie: "Don't you think the exotic atmosphere of these barn dances is just too irresistible?"
Simon: "Yep, but I'd feel more at home in this atmosphere with a broom and a shovel."

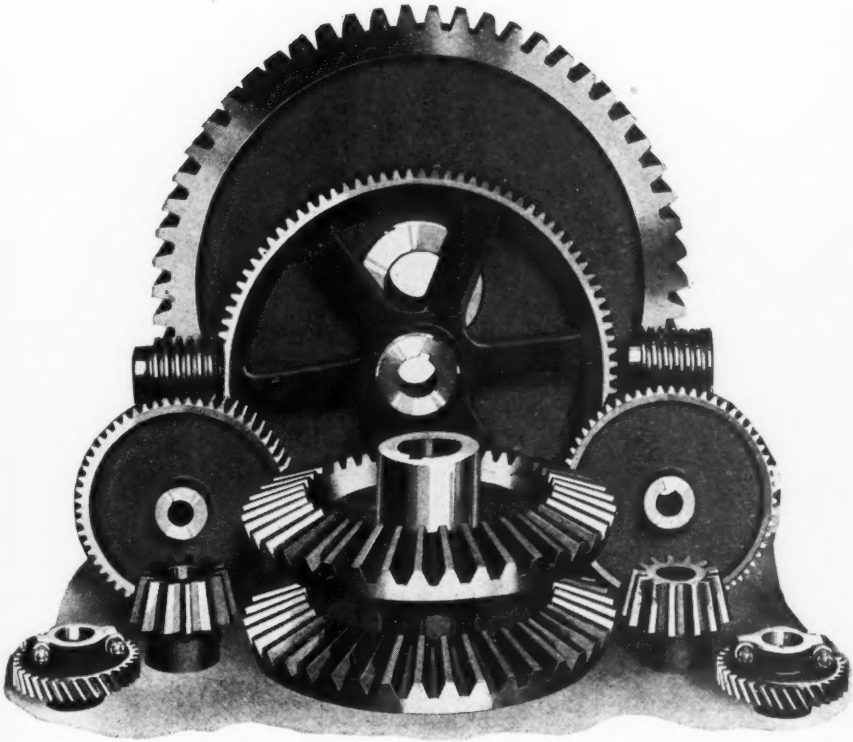
"An' what's your little doggy's name?"
Was what she asked young Spritz,
He says, "We call him Cuspidor,
Because he is a Spitz."

AIN'T IT THA TROOF?

Judgin' from tha number of most any ol' State's favorite sons, it's goin' to take a hellava lotta daughters to go 'round.

GEARS

GOOD GEARS ONLY!



Gears of Every Description

ACCURACY :: QUICK SERVICE

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THE CINCINNATI GEAR CO.

CINCINNATI, OHIO

THE STANDARD OF QUALITY
SINCE 1897

NEW!

U·S·30" HISPEED SNAGGERS
double production
HIGHSPEED WHEELS
9500 S·F·P·M·

NOW you can set new production records and cut costs to new low figures! With 30-inch wheels on this new high speed snagger, you can bite into work at the rate of 9500 surface feet per minute! And when worn down to 24-inch diameter, you get 7500 s. f. p. m.—or an average of 8500. This is on 40 or 60 cycle circuits. On 25 and 50 cycle circuits 24-inch wheels are recommended—giving 9300 s.f.p.m. This machine is especially designed and built for high speed, heavy duty work—and in accordance with A. I. E. E. specifications and A. E. S. standards. Typical U. S. quality throughout: One-piece nickel steel spindle. Four heavy duty SKF Ball Bearings. Steel safety hoods, etc.

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THE UNITED STATES ELECTRICAL TOOL CO.

Oldest Builders of Electric Drills and Grinders in the World

2471 WEST SIXTH STREET, CINCINNATI, OHIO, U. S. A.